RECORD OF DECISION AMENDMENT

for the

NORTH INDIAN BEND WASH SUPERFUND SITE
FINAL OPERABLE UNIT

SCOTTSDALE, ARIZONA

U.S. Environmental Protection Agency
Region IX
San Francisco, California

September 2001

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PART 1: THE DECLARATION

I. Site Name and Location - Indian Bend Wash Superfund Site, North Area, Maricopa County, Arizona. Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Identification Number AZD980695969.

II. Statement of Basis and Purpose

A. This decision document presents the United States Environmental Protection Agency's (EPA's) Selected Remedy for the Indian Bend Wash Superfund Site, North Area, Maricopa County, Arizona , which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on EPA's Administrative Record file.

B. The State of Arizona concurs with the Selected Remedy.

III. Assessment of Site - The response action selected in this Record of Decision Amendment (ROD Amendment) is necessary to protect the public health or welfare and the environment from actual or threatened releases of hazardous substances into the environment.

IV. Description of Selected Remedy - This remedial action for the Indian Bend Wash Superfund Site, North Area (the Site or NIBW), addresses aquifer restoration by containment, treatment and monitoring of contaminated groundwater as well as soil remediation actions. Groundwater containment and treatment is accomplished using extraction well networks, air stripping and UV Oxidation technologies. Soil treatment is accomplished using soil vapor extraction technologies.

During the early stages of the cleanup actions at NIBW, the Site was divided into operable units (OUs). Although CERCLIS reflects numerous operable units for NIBW, there are actually only two: (1) the Groundwater OU; and (2) the Soils OU.

Due to the impact of contaminated groundwater on public drinking water supplies in the early 1980's, the initial focus of the site cleanup strategy was on containing and remediating the contaminated groundwater at the Site. This groundwater cleanup effort became the first operable unit or the Groundwater OU. Remediation of contaminated soil is the second operable unit or Soils OU. The focus of the Soils OU was to eliminate any remaining threats to groundwater due to residual soil contamination.

Following the construction and initial operation of the remedy selected in 1988 for the Groundwater OU, it became apparent that the groundwater contamination had not been contained as intended. Specifically, the groundwater plume was moving to the north and threatening the drinking water supply of the city of Paradise Valley. To prevent the contamination of Paradise Valley wells, additional actions were implemented to achieve capture of the groundwater contamination plume. These actions were completed on a voluntary basis

and have not been documented in a previous record of decision

The purpose of this ROD Amendment is to select a final Remedial Action for the Site and consolidate previous decisions regarding both groundwater and soil cleanup actions into one final document.

There are no known continuing source areas or Non-Aqueous Phase Liquids (NAPLs) present at NIBW and as a result principal threat waste was not considered for this Site.

The NIBW remedy includes the following requirements and actions:

A. Groundwater containment in the Middle and Lower Aquifers at NIBW to prevent further migration of the groundwater contamination plumes;
B. Localized focus on groundwater containment including contingency actions at Areas 7 and 12 to prevent migration of the contaminants in these specific areas from migrating to the southwest margin;
C. Restoration of the Upper, Middle and Lower Aquifers to drinking water quality by decreasing the concentrations of the contaminants of concern (*see* Section V.F., page 12) to below the cleanup standards (*see* Table 3, page 24);
D. Treatment of extracted groundwater using air stripping and UV oxidation technologies;
E. Groundwater monitoring in the Upper, Middle and Lower aquifers to verify and evaluate plume control, and overall effectiveness of the remedy;
F. Continued evaluation of remedy effectiveness based on periodic updates to the groundwater model; and
G. Completion of soil cleanup actions using soil vapor extraction which were required by an NIBW Record of Decision issued in 1991.

V. Statutory Determinations

A. The Selected Remedy attains the mandates of CERCLA Section 121 and to the extent practicable, the NCP. Specifically, the remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action (unless justified by a waiver), is cost-effective, and utilizes permanent solutions to the maximum extent possible.
B. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).
C. Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining within NIBW above levels that allow for unlimited use and unrestricted exposure, but it will take more than five years to attain remedial action objectives and cleanup levels, a policy review shall be conducted within five years of construction completion for NIBW to ensure that the remedy is, or will be, protective of human health and the environment.

VI. ROD Data Certification Checklist

ROD Data Certification Checklist - The following information is included in the Decision Summary Section of this ROD Amendment (Additional information can be found in the Administrative Record file for this site):

A. The Chemicals of Concern (COCs) are trichloroethylene (TCE), tetrachloroethylene

(PCE), 1,1-dichloroethene (1,1-DCE), trichloroethane (TCA), and chloroform (CFM). A discussion of the COCs can be found in Section V.F. page 12.

B. The cleanup standards for the COCs are the Maximum Contaminant Levels (MCLs) established in the Safe Drinking Water Act with the exception of chloroform. A list of the cleanup standards for the COCs can be found in Table 3, Section VII.E. page 24;

C. The risk assessment conducted for OU I concluded that the highest potential cancer risk would have been approximately 3.8 X 10^{-5} if water from contaminated supply wells within NIBW was served to individuals without treatment, see Section VII.A. page 21;

D. Principal threat wastes were not a factor in remedy selection, see Section XI. page 40;

E. Current and reasonable anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD are discussed in Section VI. page 18;

F. Potential groundwater use that will be available at the site as a result of the Selected Remedy is discussed in Section XII.D. page 48;

G. Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected can be found in Section XII.C. page 46; and

H. Key factors that led to selecting the remedy are identified in Section XII.A. page 42.

VII. Authorizing Signature

9-27-01
Date

Keith Takata
Keith Takata, Director
Superfund Division

PART 2: THE DECISION SUMMARY

I. Site Name, Location, and Description

This Record of Decision Amendment (ROD Amendment) addresses the North Indian Bend Wash Superfund Site (NIBW or the Site), which is located in Scottsdale, Arizona. The CERCLIS Identification Number for the Site is AZD980695969. The lead agency is the U. S. Environmental Protection Agency (EPA) and the support agency is the Arizona Department of Environmental Quality (ADEQ). The Site is being addressed as an enforcement-lead site and the expected source of cleanup monies is a settlement with Potentially Responsible Parties (PRPs).

The Site originally consisted of distinct isolated areas of soil contamination and groundwater contamination plumes. At this time, most of the soil contamination has been remediated. The groundwater is present in three separate levels or layers. These layers are referred to as the Upper, Middle, and Lower Aquifers. All three of these aquifers are contaminated.

The entire area of the Indian Bend Wash Superfund Site covers approximately 13 square miles in Scottsdale and Tempe, Arizona. The site was divided into two areas known as the Indian Bend Wash Area - North (NIBW - located in Scottsdale) and the Indian Bend Wash Area - South (SIBW - located in Tempe) (See Figure 1, page 5)[1]. This ROD Amendment focuses on NIBW only. More information on SIBW can be obtained at the information repository located at the Tempe Public Library, 3500 South Rural Road, Tempe, AZ 85282.

II. Site History and Enforcement Activities

There are numerous industrial facilities located in the NIBW area. Up until the 1970s, before our current environmental regulations existed, industrial solvents containing volatile organic compounds (VOCs) were typically disposed of directly onto the ground or in dry wells. These disposal practices, along with other releases, resulted in soil and groundwater contamination at NIBW.

Groundwater contamination at NIBW was discovered in 1981 when elevated levels of VOCs including trichloroethylene (TCE), tetrachloroethylene (PCE) and chloroform were found in several Scottsdale-area drinking water wells. As a result, local water providers stopped using those wells for drinking water. EPA and ADEQ have been involved in investigations and cleanup activities at NIBW since the initial discovery of VOCs in the groundwater in 1981. The entire Site, including both NIBW and SIBW, was placed on EPA's National Priorities List (NPL), or Superfund list, in 1983.

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[1] The boundaries shown on Figures 1 and 2 for NIBW and SIBW are not the legal boundaries of the sites. The boundaries identified on these figures depict the study areas for NIBW and SIBW. The actual boundaries of the NIBW site are based on the definition of "facility" in CERCLA Section 101(9).

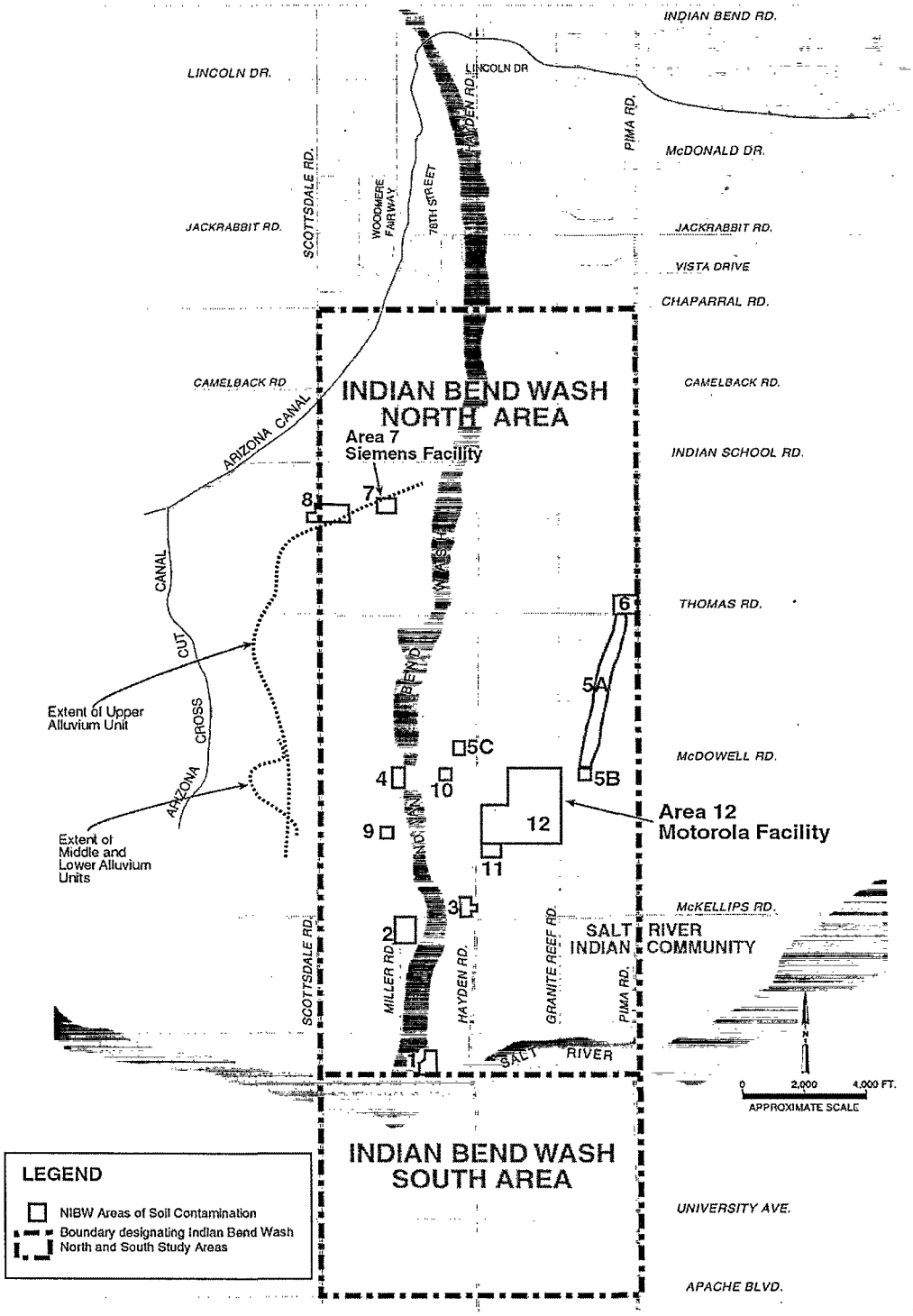
INDIAN BEND RD.
LINCOLN DR.
LINCOLN DR
HAYDEN RD.
PIMA RD.
McDONALD DR.
SCOTTSDALE RD.
WOODMERE FAIRWAY
78TH STREET
JACKRABBIT RD.
JACKRABBIT RD.
VISTA DRIVE
CHAPARRAL RD.
CAMELBACK RD
INDIAN BEND WASH NORTH AREA
CAMELBACK RD.
Area 7
Siemens Facility
ARIZONA CANAL
INDIAN SCHOOL RD.
8
7
CUT
CROSS
ARIZONA CANAL
6
THOMAS RD.
5A
Extent of Upper Alluvium Unit
5C
4
10
5B
McDOWELL RD.
Area 12
Motorola Facility
12
9
11
Extent of Middle and Lower Alluvium Units
3
McKELLIPS RD.
2
SALT RIVER INDIAN COMMUNITY
SCOTTSDALE RD.
MILLER RD.
HAYDEN RD.
GRANITE REEF RD.
PIMA RD.
1
SALT RIVER
0
2,000
4,000 FT.
APPROXIMATE SCALE
INDIAN BEND WASH SOUTH AREA
LEGEND
NIBW Areas of Soil Contamination
Boundary designating Indian Bend Wash North and South Study Areas
UNIVERSITY AVE.
APACHE BLVD.

FIGURE 1

NIBW was investigated in two phases, typically referred to as Operable Units (OUs)[2]. For practical purposes, the groundwater contamination at NIBW is considered the first Operable Unit (OU I). OU I is also referred to as the Scottsdale Groundwater Operable Unit. OU II includes groundwater in the shallow aquifer and soil contamination in specific isolated areas.

The Remedial Investigation (RI) for OU I began in July 1984 and was completed in August 1986. This RI focused on characterizing the groundwater conditions as well as determining the extent of groundwater contamination. The Feasibility Study (FS) for OU I was completed in April 1988 and addressed only the Middle and Lower Aquifers at NIBW. On September 21, 1988 EPA, in consultation with ADEQ, issued a ROD for the Scottsdale Groundwater Operable Unit.

The RI and the FS for the second Operable unit, or OU II, were completed in April 1991 as a single document. The OU II RI/FS focused on the groundwater contamination in the Upper Aquifer and soil contamination at certain industrial facilities at NIBW. In total, 14 facilities or distinct areas were investigated. These areas are numbered 1 through 12. Area 5 consists of three different parts: 5A, 5B and 5C. Figure 1 on page 5 depicts the different areas investigated. EPA issued the OU II ROD in September 1991.

EPA has negotiated two Consent Decrees (CDs) with the potentially responsible parties (PRPs) at NIBW. Although EPA investigated numerous PRPs, the parties that have continued to work cooperatively with EPA at the NIBW site are: Motorola Inc., Siemens Corporation, Smith-Kline Beecham Corporation, the Salt River Valley Water Users' Association, and the City of Scottsdale. In 1991, EPA completed negotiations for the first CD for implementation of the cleanup actions selected in the 1988 ROD. The main goals of this first ROD and CD were to make sure the groundwater contamination plume was not migrating beyond the site boundaries and to begin aquifer restoration.

In August 1993, EPA completed negotiations for a second CD with Motorola Inc., Siemens Corporation, the Salt River Valley Water Users' Association, the Salt River Project Agricultural Improvement & Power District, Smith-Kline Beecham Corporation, City of Scottsdale, L.D. Hancock & Elaine Hancock, the Highsmith Company, Microsemi Corporation -- Scottsdale P.A.G.E. -- Layher, and Scottsdale Memorial Hospital. This CD was for implementation of the cleanup actions selected in the 1991 ROD. The main goals of the OU II ROD and CD were to address soil contamination at specific facilities and monitor the groundwater in the Upper Aquifer.

Following the construction and initial operation of the remedy selected in 1988 for the Groundwater OU, it became apparent that the groundwater contamination had not been contained as intended. Specifically, the groundwater plume was moving to the north and

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[2] It should be noted that these OU designations are not equivalent to the OU designations in CERCLIS (or WASTELAN). The OUs in CERCLIS are numbered one to seven. OUs three and seven are for SIBW and not associated with NIBW. OU2 is actually the first OU or the Scottsdale Groundwater OU and the ROD for this OU was issued on September 21, 1988. OUs 1, 4, 5, and 6 all make up the second operable unit and the ROD issued on September 12, 1991 covers all of these OUs.

threatening the drinking water supply of the city of Paradise Valley. To prevent the contamination of Paradise Valley wells, additional actions (which are discussed in detail in Section IX.C., pages 27-28) were implemented to achieve capture of the groundwater contamination plume. These actions were completed by the PRPs on a voluntary basis and have not been documented in a previous record of decision

In November 2000, the PRPs completed a feasibility study addendum (FSA) for NIBW which evaluated seven alternative approaches to improve the existing groundwater remediation systems. The FSA fulfills a requirement of the first Consent Decree for a supplemental study to evaluate the effectiveness of the overall groundwater remedy and methods to enhance its effectiveness.

III. Community Participation

The FSA Report and the third Proposed Plan for the NIBW Superfund Site in Scottsdale Arizona, were made available to the public in April 2001. These documents can be found in the Administrative Record file in the information repositories maintained at the EPA Region 9 Record Center at 75 Hawthorne Street in San Francisco and at the Scottsdale Civic Center Library at 3838 Civic Center Plaza, Scottsdale, Arizona. The notice of availability of the FSA, Proposed Plan, date and location for the public meeting and public comment period (April 30, 2001 through June 28, 2001) were published on April 30 in the Arizona Republic, the Scottsdale Tribune, and the Paradise Valley Independent newspapers. The public meeting was held May 9, 2001. The transcript of the public meeting is part of the Administrative Record and can be found in the information repositories identified above. EPA's response to comments received at the public meeting and written comments can be found in Part III of this ROD Amendment - the Responsiveness Summary. An overview of the proposed plan was presented by EPA at the public meeting and questions were addressed by a panel comprised of EPA, ADEQ, the Arizona Department of Water Resources (ADWR), Arizona Department of Health Services (ADHS), and the PRPs.

Beginning in mid-1996, EPA began conducting periodic meetings with small groups of citizens to provide updates on Site activities. The group of citizens became known as the NIBW Community Involvement Group (CIG). The CIG meetings were convened to provide interested community members from Scottsdale and neighboring areas with a forum to gather information on soil and groundwater cleanup strategies and gain detailed knowledge of Site activities over time. The CIG meetings have been an effective way to provide information to the community on a continuing basis and has been a valuable vehicle for the citizens to provide EPA and the PRPs with input regarding cleanup activities. The CIG meets informally and there are no specific requirements regarding the dynamic of the group or the frequency of meetings. CIG meetings are held on an "as needed" basis and are open to anyone interested in the Site.

IV. Scope and Role of the Operable Unit or Response Action

NIBW is a large complex site with groundwater contamination present in all three existing aquifers. In order to manage the Site in the most effective manner, EPA divided the Site into Operable Units. EPA anticipates that the remedial actions selected in this ROD Amendment will

be implemented by the PRPs. A description of the Operable Units or OUs is as follows:

A. OU I is the Scottsdale Groundwater OU. The ROD for OU I was issued in September 1988 and the PRPs implemented the work required by this ROD under the first CD. The goal of the OU I ROD was containment of the groundwater plumes and the OU I remedy failed to accomplish containment. As a result the PRPs worked cooperatively with EPA and the state agencies to implement additional actions in order to capture the plume. These actions became known as the Remedy Enhancements and are described in detail in Section IX.C., pages 27-28.

B. OU II included soils and groundwater in the Upper Aquifer. The ROD for OU II was issued in September 1991 and the PRPs implemented the work required by the OU II ROD under the second CD. The goal of the OU II ROD was to eliminate continuing groundwater contamination sources in the soil and to monitor the groundwater contamination in the Upper Aquifer.

C. This third ROD is technically an amendment to the OU I ROD. This ROD Amendment documents EPA's decision to select the actions previously required by the OU I ROD plus additional actions that are necessary to contain the groundwater contamination plume and restore the aquifer. This ROD Amendment is consistent with but does not alter the remedies selected in the OU II ROD. This ROD Amendment is anticipated to be the final decision document for NIBW. The goal of this ROD Amendment is an overall, comprehensive site cleanup strategy that will effectively remediate the contamination at NIBW over the long-term.

V. Site Characteristics

A. Conceptual Site Model

The Conceptual Site Model for the risk assessment and response action(s) were developed at the time that the 1988 and 1991 RODs were issued. The risk associated with ingestion of, inhalation of, or dermal contact with contaminants in groundwater was the driving factor for the OU I ROD. The OU II remedy was selected based on the threat posed by the potential for continuing contamination of the groundwater as a result of VOC contamination in soil. Direct contact exposure to VOCs in soil is not considered to be a significant threat. At this time, although much of the work required by the OU I and OU II RODs is complete, the Conceptual Site Model for potential risk and exposure remains the same. The final Remedial Action for NIBW will be based on reduction of risk due to the potential for exposure to contaminated groundwater. Exposure through the use of contaminated groundwater from private drinking water wells or public drinking water supplies could include ingestion of, inhalation of, and dermal contact with elevated levels of VOCs. Because the risk and the Conceptual Site Model remain the same, a new risk assessment was not conducted and the remedy selected in this ROD Amendment will be based on all of the Site data that has been generated to date and the risk assessments conducted for the OU I and OU II RODs.

Nearby surface water bodies include the Indian Bend Wash (the Wash), the Salt River, and the Salt River Project (SRP) canal system. In the early 1980's VOCs were detected in the Wash and determined to be a result of groundwater discharge into the ponds that make up the Wash. Groundwater discharge into these ponds was discontinued and subsequent sampling confirmed that VOCs were no longer present. Based upon the information currently available to EPA, the groundwater does not seep up to the surface or impact the Wash, the Salt River, or the canal system directly. Therefore, there are no known receptors for an ecological assessment.

B. Overview of Site

The NIBW Site encompasses approximately ten square miles. NIBW is located in the southern part of the Paradise Valley basin, which is in the east part of the Salt River Valley in Arizona. The Paradise Valley basin is bounded on the northeast by the McDowell Mountains, and on the west and southwest by the Phoenix Mountains, Camelback Mountain, and Papago Buttes. The original boundaries of the NIBW study area were designated as follows: Chaparral Road to the north, Pima Road to the east, Scottsdale Road to the west and the Salt River to the south. Since that time the groundwater contamination plume has migrated beyond the study area boundaries and therefore expanded the area of the Site. The most recent groundwater data indicates that the plume is as far north as Jackrabbit Road and in the southern portion of the site the plume has traveled west almost to 68th Street (*see* Figure 2 on page 10).

C. Surface and Subsurface Features

Land surface in the Paradise Valley basin generally slopes to the south where it merges with the floodplain of the Salt River. As indicated above, principal surface-water features in the vicinity of the Site include the Salt River, the Indian Bend Wash (the Wash), and the SRP canal system.

The Wash is the primary surface-water drainage feature for the Site. Flow into the Salt River from the Wash occurs infrequently in response to sustained precipitation events. Historically, the Wash was a natural desert wash emptying southward into the Salt River. During the 1970's, the U.S. Army Corps of Engineers, Maricopa County and the City of Scottsdale developed the Wash into a "green belt" within NIBW. It now consists of a series of linked ponds surrounded by irrigated recreational areas such as parks and golf courses. The Wash is lined with concrete south of the southernmost pond. During periods of flooding, the ponds in the Wash may overflow and discharge water to the Salt River. A second major wash in the area, the Granite Reef Wash, drains water along the eastern side of NIBW down to the Salt River.

The Salt River is located near the southern boundary of the Site. Releases from the Granite Reef Dam, located upstream from the Site, are principally responsible for flows in the Salt River. Discharges to the Salt River were generally small to absent during the period 1986 through 1991, but increased in 1992, 1993, and 1995.

The SRP canal system in the vicinity of NIBW consists of the Arizona Canal, the Arizona Cross Cut Canal, various smaller lined and unlined ditches, and pipeline

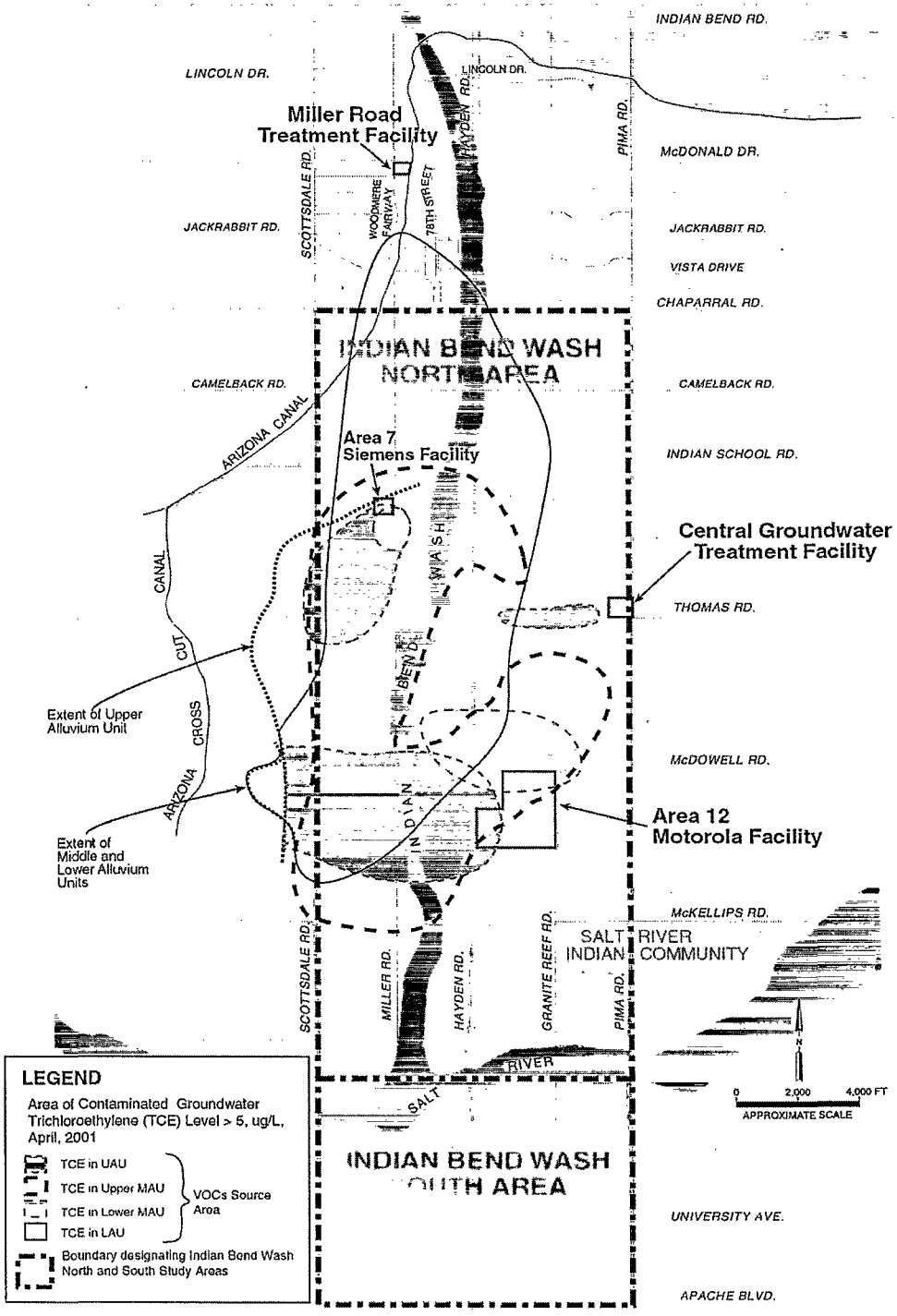

INDIAN BEND RD.
LINCOLN DR.
LINCOLN DR.
HAYDEN RD.
PIMA RD.
Miller Road
Treatment Facility
McDONALD DR.
SCOTTSDALE RD.
WOODMERE FAIRWAY
78TH STREET
JACKRABBIT RD.
JACKRABBIT RD.
VISTA DRIVE
CHAPARRAL RD.
INDIAN BEND WASH
NORTH AREA
CAMELBACK RD.
CAMELBACK RD.
ARIZONA CANAL
Area 7
Siemens Facility
INDIAN SCHOOL RD.
Central Groundwater
Treatment Facility
CANAL
CUT
CROSS
ARIZONA
THOMAS RD.
Extent of Upper
Alluvium Unit
McDOWELL RD.
Area 12
Motorola Facility
Extent of
Middle and
Lower Alluvium
Units
McKELLIPS RD.
SALT RIVER
INDIAN COMMUNITY
SCOTTSDALE RD.
MILLER RD.
HAYDEN RD.
GRANITE REEF RD.
PIMA RD.
RIVER
SALT
INDIAN BEND WASH
SOUTH AREA
UNIVERSITY AVE.
APACHE BLVD.
N
0
2,000
4,000 FT
APPROXIMATE SCALE
LEGEND
Area of Contaminated Groundwater
Trichloroethylene (TCE) Level > 5, ug/L,
April, 2001
TCE in UAU
TCE in Upper MAU
TCE in Lower MAU
TCE in LAU
VOCs Source
Area
Boundary designating Indian Bend Wash
North and South Study Areas

FIGURE 2

systems. This canal system is chiefly used to convey surface water from reservoirs located upstream along the Salt and Verde Rivers to downstream municipal and agricultural users in the Phoenix area. Groundwater is also pumped into the canal system from selected production wells, as necessary, based on availability of surface-water supplies and water demand. Although the two major canals in the area, the Arizona and Cross Cut Canals, are lined, some leakage from the canal system occurs.

D. Sampling Strategy

NIBW is located within the city limits of Scottsdale and has been fully developed with residences, commercial buildings and industrial structures. There are no known areas of archaeological or historical features at NIBW. Numerous groundwater monitoring wells and groundwater extraction wells are located throughout the Site. The Central Groundwater Treatment Facility (CGTF) is located at the corner of Thomas and Pima Roads and the Miller Road Treatment Facility is located on Miller Road and McDonald Drive. Groundwater extraction and treatment systems are also located at Area 7 (the Siemens facility) and Area 12 (the Motorola facility). There are also remnants of Soil Vapor Extraction (SVE) soil treatment systems located throughout the Site. However, EPA has approved the decomissioning of most of these SVE systems and many have been dismantled or are in the process of being dismantled.

Since the discovery of TCE in Scottsdale area wells in 1981, there have been numerous investigations conducted at NIBW (for a detailed description of these investigations please refer to Section 2.1.4 of the FSA, pages 2-5 to 2-30).

There are currently over 150 monitoring wells in the groundwater monitoring network at NIBW. Starting in 1983, monitoring wells were installed in the Upper, Middle, and Lower Aquifers in several different phases. This work was conducted by many different entities (e.g., EPA, Motorola, Siemens, etc.). The goal of the groundwater sampling strategy both in the present and in the past has been to determine the nature and extent of the contaminant plumes as well as to characterize the flow patterns of these groundwater formations.

Groundwater and soil sampling data were collected as part of the OU I and OU II remedial investigations. Both the OU I and OU II RODs required the installation and sampling of additional monitoring wells. All of the wells in the monitoring network are sampled every 6 months. This data will continue to be collected and compiled to help monitor the effectiveness of the groundwater remedy into the future.

The areas of soil contamination were fully characterized during the OU II remedial investigation. As a result, areas of soil contamination that were determined to be a threat to groundwater have been remediated (or are in the process of being remediated) using SVE, as required by the OU II ROD. No additional soil investigations are anticipated to be necessary.

E. Known and Suspected Sources of Groundwater Contamination

During the OU II remedial investigation EPA investigated areas of suspected soil

contamination throughout NIBW which had the potential to be sources of contamination to the groundwater. In total, 14 facilities or distinct areas were investigated. These areas are numbered 1 through 12. Area 5 consists of three different parts: 5A, 5B and 5C (*see* Figure 1 on page 5).

Soil contaminated with VOCs was detected in the immediate vicinity of most of the 14 potential source areas that were investigated. EPA determined that exposure to the contaminated soils did not pose a significant health threat. However, based on fate and transport modeling results it was concluded that the concentrations of contaminants in soil at some of the facilities were sufficiently high enough to cause further contamination of the groundwater. Therefore, soil cleanup was required as part of the OU II ROD at Areas 7, 8, and 12 to eliminate the threat to the groundwater. This soil cleanup work will be completed by the end of 2001 and there are no other known source areas remaining at NIBW.

F. Types of Contamination and Affected Media

As stated previously, the contaminants of concern (COCs) found in soil and groundwater at NIBW are volatile organic compounds or VOCs. Trichloroethylene (TCE) is the primary VOC of concern, although tetrachloroethylene (PCE), 1,1-dichloroethene (1,1-DCE), trichloroethane (TCA), and chloroform (CFM) have also been detected at lower concentrations. Heavy metals do not appear to be present at NIBW from other than natural sources. Table 1 below identifies the types and characteristics of the COCs.

Table 1: Types and Characteristics of Contaminants of Concern (COCs)

Contaminant/Abbreviation/ Category	Mobility	Carcinogenic	Non-Cancer Risks
Trichloroethylene/TCE/ VOC	High	yes	yes
Tetrachloroethene/PCE/ VOC	High	yes	yes
1,1-Dichloroethene/1,1-DCE/ VOC	High	yes	yes
Trichloroethane/TCA /VOC	High	no	yes
Chloroform/CHCl3/VOC	Very High	yes	yes

The affected media at NIBW had been both soil and groundwater. As discussed above, the soil contamination has been addressed as required by the OU II ROD. The media that continues to be a concern is the groundwater.

G. Description of Aquifers, Sub-Surface Features, and Potential Routes of Migration

The NIBW study area is underlain by alluvial sediments which can be divided into four hydrostratigraphic units. These units consist of the Upper Aquifer (or Upper Alluvial Unit), the Middle Aquifer (or Middle Alluvial Unit), the Lower Aquifer (or Lower Alluvial Unit), and the Red Unit. Groundwater plumes contaminated with VOCs have

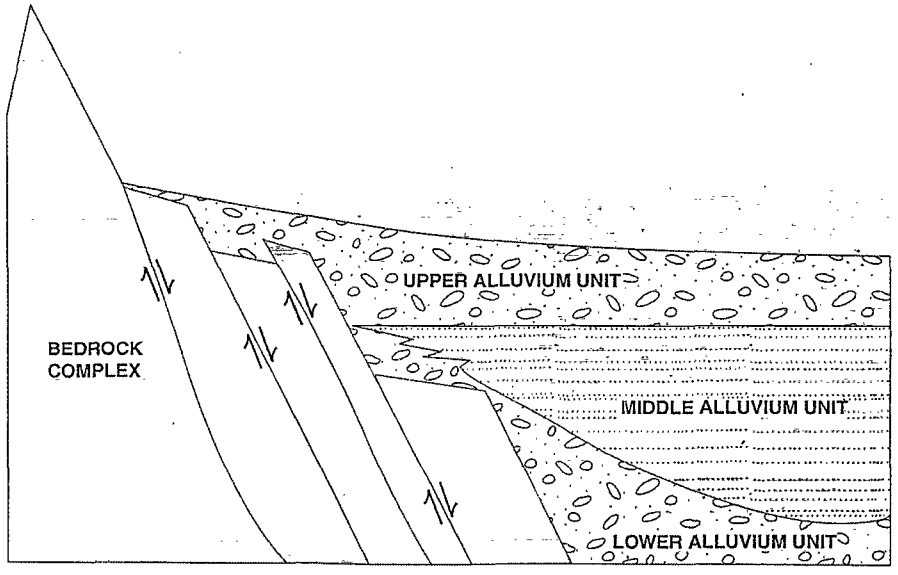
been characterized in the Upper, Middle, and Lower Aquifers at NIBW.

The Upper Aquifer varies in thickness; however, in the vicinity of the study area, the thickness of the Upper Aquifer is approximately 120 to 160 feet. The Upper Aquifer consists primarily of sand, course gravel, cobbles, and boulders in this area. Groundwater occurs at depths ranging from approximately 90 feet to approximately 130 feet below ground surface (bgs), with up to 40 feet of saturated thickness. The saturated thickness of the unit changes with time of year and generally decreases to the north.

The Middle Aquifer primarily consists of silt, clay, and interbedded fine sands. Relatively thin layers of coarser deposits are scattered throughout the unit. The thickness of the Middle Aquifer ranges from approximately 360 to 660 feet. Water levels in wells perforated in the middle aquifer occur at depths of 140 to 180 feet.

The Lower Aquifer consists of weakly to strongly cemented gravel, boulders, sand, sandy clay, silty sand, and interbedded clay. The portion of the Lower Aquifer penetrated by monitoring wells has generally coarser grained material than the Middle Aquifer. The thickness of the Lower Aquifer in the study area is not well known. Water levels measured in the Lower Aquifer are range from 166 to 212 feet bgs.

Water level data indicate that there is a downward-directed vertical hydraulic gradient between the Upper Aquifer and the Middle Aquifer and between the Middle Aquifer and the Lower Aquifer. Figure 3 below depicts the Upper, Middle, and Lower Aquifers.



Schematic Hydrogeologic Section

FIGURE 3

There is a deeper aquifer at NIBW known as the Red Unit. The Red Unit comprises a wide range of tertiary sediments with reddish-brown color and distinctive cementation. Groundwater is expected to flow through the Red Unit as a continuous porous medium with enhanced flow potential where it has been fractured and faulted. The Red Unit is expected to occur between the Lower Aquifer and the basement rocks; however, the Red Unit has not been fully characterized in NIBW investigations.

The areal extent of the contamination is currently located roughly between McKellips Road to the south and Jackrabbit Road to the north. The eastern edge of the plume extends close to Pima Road. The western edge of the plume is just beyond Scottsdale Road in the southern portion of the plume but does not cross Scottsdale Road in the northern portion of the plume (*see* Figure 2 on page 10).

The area known as the southwest margin warrants some additional discussion. The southwest margin is generally defined to be the area bounded to the east by Scottsdale Road, to the south by McKellips Road, to the north by McDowell Road, and to the west by the area where the alluvial sediments pinch out as they approach at Papago Buttes. The southwest margin is an integral component of the conceptual model of groundwater flow for the Site. Hydrogeologic conditions and the distribution of TCE along the southwest margin needed to be characterized to provide a basis for evaluating patterns of groundwater movement and contaminant occurrence that are important to the understanding of the Conceptual Site Model.

Groundwater in the Upper Aquifer generally moves from east to west across the Site toward the southwest margin. Upon reaching the southwest margin, groundwater in the Upper Aquifer moves downward and eastward in response to the downward hydraulic gradient. This vertical movement occurs from the Upper Aquifer either to the Lower Aquifer directly or through a thin layer of Middle Aquifer sediments. This movement results from the regional downward hydraulic gradient that is caused by large-scale historic deep groundwater extraction from Lower Aquifer production wells to the north. This downward vertical movement in the southwest margin is facilitated by the thinning and, in some areas, the absence of Middle Aquifer sediments west of Scottsdale Road.

During development of the FSA the PRPs developed a groundwater model with input from EPA and the state. The FSA Model is based on the Conceptual Site Model that includes and, by necessity, simplifies the geologic framework, Site hydrogeologic conditions, and the nature and extent of contamination. The FSA Model was designed to be consistent with the Site conceptual model and previous modeling efforts. The model was developed using the well-accepted modeling codes MODFLOW (McDonald and Harbaugh, 1988) for groundwater flow and MT3D^{96} (S.S. Papadopulos and Associates, Inc., 1996) for solute transport.

The FSA Model was designed to simulate the observed vertical and horizontal distributions of groundwater elevations and TCE concentrations. TCE was chosen as the solute to model because it is the primary VOC of interest for the Site and it generally represents the zones of VOC contamination at the Site. Detailed information on the groundwater model can be found in the FSA and the North Indian Bend Wash Feasibility

Study Addendum Groundwater Model Final Report. Both of these models can be found in the Administrative Record.

H. Location of Contamination

Areas of concern within the groundwater plumes at NIBW are generally identified based on concentrations of TCE above the federal Safe Drinking Water Act Maximum Contaminant Levels (MCL). MCLs are EPA's standards for drinking water quality. The MCLs for the COCs at NIBW are as follows: TCE - 5 micrograms per liter (ug/l), PCE - 5 ug/l, 1,1-DCE - 6 ug/l, 1,1,1-TCA - 200 ug/l, and Chloroform - 100 ug/l. The plumes at NIBW are defined as areas of groundwater contamination at concentrations of TCE greater than the MCL, or 5 ug/l.

The hydrogeology at NIBW is fairly complex and the location of the specific zones within each alluvial unit, or aquifer, warrants some further explanation. It is also important to note that the zones of water within each aquifer do not necessarily flow in the same direction. The descriptions below define each zone in terms of the extent of TCE contamination.

In the Upper Aquifer there are three distinct contamination plumes referred to as Zones A, B and C. Zone A is defined as the plume that extends southward from Areas 7 and 8 and the groundwater in this zone flows toward the south-southwest. Zone B is defined as the plume that extends west from Area 6 and the groundwater in this zone flows toward the west. Zone C is defined as the plume that extends west from Area 12 and the groundwater in this zone flows toward the west. Zones A, B, and C are depicted in Figure 4 on page 16.

The latest groundwater data, collected in April 2001, indicates that the highest concentration of TCE in Zone A is 54 ug/l, the highest concentration of TCE in Zone B is 23 ug/l, and the highest concentration of TCE in Zone C is 2.6 ug/l. In April 1998, the highest concentration of TCE in Zone A was 200 ug/l, the highest concentration of TCE in Zone B was 19 ug/l, and the highest concentration of TCE in Zone C was 62 ug/l.

In the Middle Aquifer there are five distinct groundwater contamination plumes referred to as Zones D, E, F, G1 and G2. Zones D, E and F are located in the upper portion of the Middle Aquifer and Zones G1 and G2 are located in the lower portion of the Middle Aquifer. Zone D is defined as the plume that extends south and east from Area 7. Groundwater flow direction in Zone D varies in accordance with pumping stresses and is primarily to the south and east. Zone E is defined as the plume that extends southwest and northeast from Area 12 and the groundwater flow direction in this zone is generally to the west but varies based on regional pumping of wells. Zone F is defined as the western extension of Zone E. The predominant groundwater flow direction in Zone F is vertical to the Lower Aquifer and varies based on regional pumping and Salt River flow events. Zones D, E, and F are depicted in Figure 5 on page 17. Zone G1 is defined as the plume that extends north and northwest from Area 12 and the groundwater in this zone flows generally to the west or northwest and varies based on regional pumping.

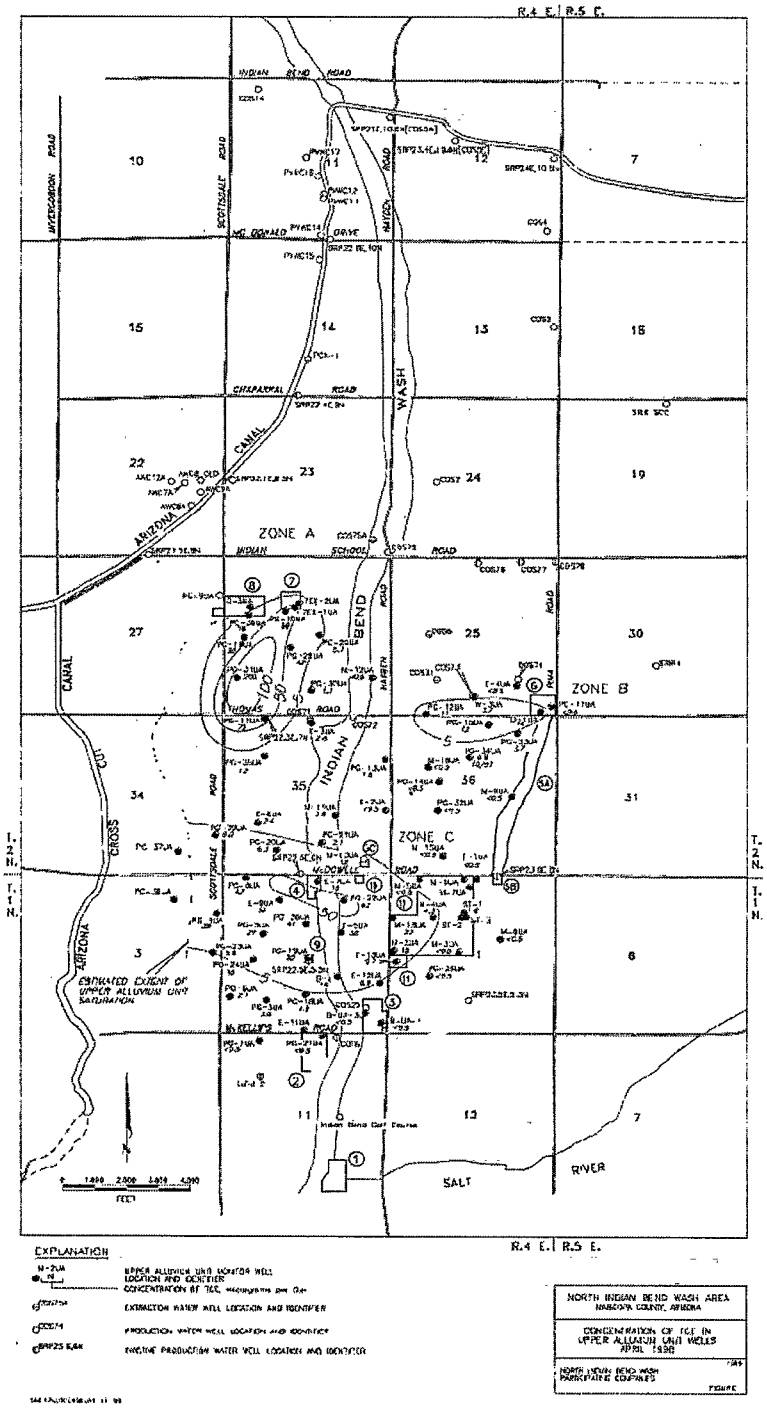

R.4 E. | R.5 E.
INDIAN BEND ROAD
McDONALD DRIVE
CHAPARRAL ROAD
INDIAN SCHOOL ROAD
ZONE A
ZONE B
ZONE C
INDIAN BEND WASH
CROSS CUT CANAL
ARIZONA CANAL
SCOTTSDALE ROAD
HAYDEN ROAD
McDOWELL ROAD
THOMAS ROAD
McKELLIPS ROAD
ESTIMATED EXTENT OF UPPER ALLUVIUM UNIT SATURATION
SALT RIVER
T. 2 N.
T. 1 N.
R. 4 E.
R. 5 E.
FEET
EXPLANATION
UPPER ALLUVIUM UNIT MONITOR WELL LOCATION AND IDENTIFIER
CONCENTRATION OF TCE, micrograms per liter
EXTRACTION WATER WELL LOCATION AND IDENTIFIER
PRODUCTION WATER WELL LOCATION AND IDENTIFIER
INACTIVE PRODUCTION WATER WELL LOCATION AND IDENTIFIER
NORTH INDIAN BEND WASH AREA
MARICOPA COUNTY, ARIZONA
CONCENTRATION OF TCE IN UPPER ALLUVIUM UNIT WELLS
APRIL 1996
NORTH INDIAN BEND WASH INVESTIGATIVE CONFINES
FIGURE

FIGURE 4

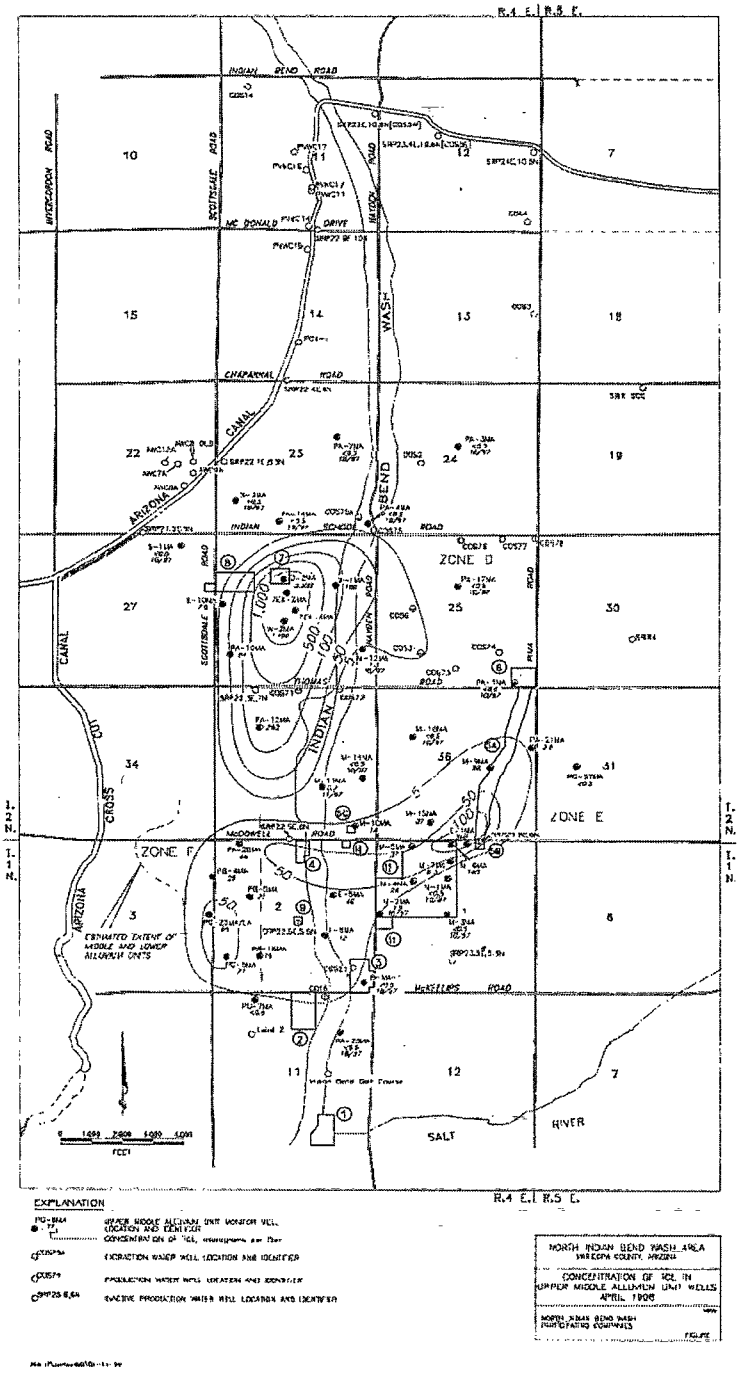

R.4 E.
R.5 E.
INDIAN BEND ROAD
MC DONALD DRIVE
CHAPARRAL ROAD
INDIAN SCHOOL ROAD
McKELLIPS ROAD
McDOWELL ROAD
THOMAS ROAD
HAYDEN ROAD
SCOTTSDALE ROAD
PIMA ROAD
HAYDEN WASH
INDIAN BEND WASH
CROSS CUT CANAL
ARIZONA CANAL
ZONE D
ZONE E
ZONE F
1,000
500
100
50
5
ESTIMATED EXTENT OF MIDDLE AND LOWER ALLUVIUM UNITS
SALT RIVER
T. 2 N.
T. 1 N.
EXPLANATION
UPPER MIDDLE ALLUVIAL UNIT MONITOR WELL LOCATION AND IDENTIFIER
CONCENTRATION OF TCE, micrograms per liter
EXCAVATION WATER WELL LOCATION AND IDENTIFIER
PRODUCTION WATER WELL LOCATION AND IDENTIFIER
INACTIVE PRODUCTION WATER WELL LOCATION AND IDENTIFIER
NORTH INDIAN BEND WASH AREA
MARICOPA COUNTY, ARIZONA
CONCENTRATION OF TCE IN UPPER MIDDLE ALLUVIUM UNIT WELLS
APRIL 1996
NORTH INDIAN BEND WASH INVESTIGATING COMPANIES
FIGURE

FIGURE 5

Zone G2 is defined as a narrow plume that extends south from the vicinity of the Hayden Road and Indian School Road intersection and the groundwater in this zone flows generally to the south. Zones G1 and G2 are depicted in Figure 6 on page 19. The highest concentrations of TCE in the Middle Aquifer as of April 2001 are as follows: Zone D = 2,900 ug/l, Zone E = 5.5 ug/l, Zone F = 120 ug/l, Zone G1 = 100 ug/l, and Zone G2 = 5.1 ug/l. In April 1998, the highest concentration of TCE in Zone D was 3,200 ug/l, Zone E was 340 ug/l, Zone F was 77 ug/l, Zone G1 was 120 ug/l, and Zone G2 was 10 ug/l.

There is only one plume in the Lower Aquifer. This plume is divided into three zones of contamination (H, I, and J). Zone H is defined as the portion of the plume that extends from Indian School Road north to Jackrabbit Road. Zone I is defined as the portion of the plume extending from Indian School Road south to an east-west trending line approximately 200 feet south of Thomas Road. Zone J is defined as the portion of the plume that extends from an area about 1500 feet north of the intersection of Scottsdale and McKellips Roads north to Zone I. In general, the groundwater in the Lower Aquifer flows toward the north. Zones H, I, and J are depicted in Figure 7 on page 20. The highest concentrations of TCE in the Lower Aquifer as of April 2001 are as follows: Zone H = 260 ug/l, Zone I = 55 ug/l, and Zone J = 74 ug/l. In April 1998, The highest concentrations of TCE in the Lower Aquifer were as follows: Zone H was 150 ug/l, Zone I was 89 ug/l, and Zone J was 100 ug/l.

The data trends showing the groundwater plumes diminishing in size and decreasing contaminant concentrations can be attributed to the cleanup work that has either been completed or is in progress at NIBW. This ROD Amendment will finalize the groundwater cleanup remedy and ensure that the affected aquifers are restored to acceptable water quality standards.

VI. Current and Potential Future Land and Resources Uses

Land use in the NIBW area includes residential, industrial/commercial, agricultural, public and private recreational (parks, golf courses, playing fields, etc.), undeveloped open space, and waterways. Within the Site, approximately 90 percent of the land use is divided between residential (60 percent), industrial/commercial (17 percent), and recreational (13 percent). Areas surrounding the Site, particularly those east of the Site, include more agricultural land uses and undeveloped open space. Land use in the greater Paradise Valley basin is generally divided into 40 percent residential, 20 percent undeveloped open land, 15 percent agricultural, 12 percent recreational, 10 percent industrial/commercial, and 3 percent waterways. These land uses are not anticipated to change in the future.

Groundwater in the area is used as a drinking water source and for irrigation purposes. The groundwater that is extracted from within the plume is treated to drinking water standards before being served to the public. Although long-term use of the groundwater as a drinking water source is expected to continue, it should be noted that there are some naturally occurring substances in the groundwater that could curtail its use in the future (*i.e.*, arsenic, nitrates, etc.). Area 7 groundwater is treated and then used to recharge the Upper Aquifer.

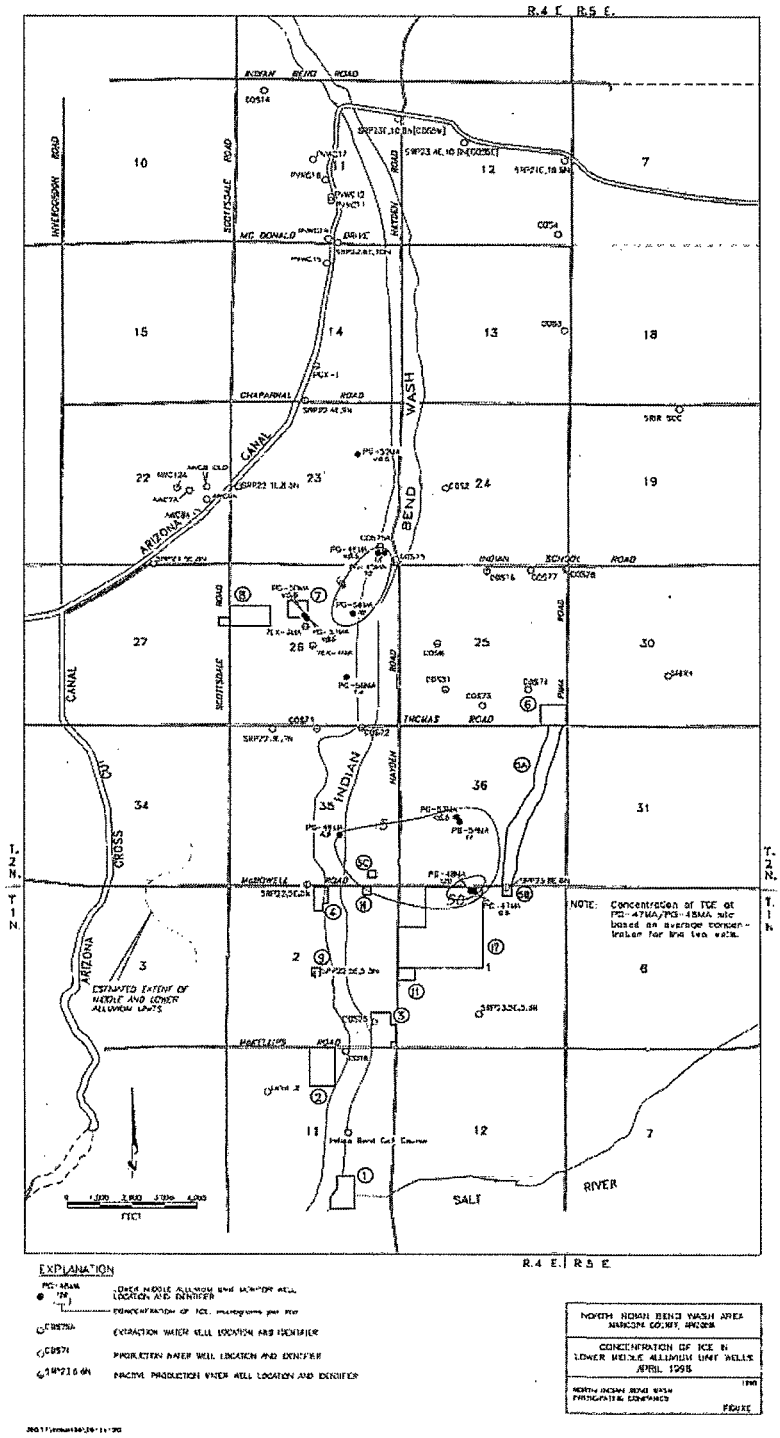

R.4 E. R.5 E.
INDIAN BEND ROAD
MC DONALD
CHAPARRAL ROAD
ARIZONA CANAL
INDIAN BEND WASH
INDIAN SCHOOL ROAD
THOMAS ROAD
MCKELLIPS ROAD
SCOTTSDALE ROAD
HAYDEN ROAD
CROSS CANAL
10
11
12
7
15
14
13
18
22
23
24
19
27
26
25
30
34
35
36
31
3
2
1
6
T. 2 N.
T. 1 N.
ESTIMATED EXTENT OF MIDDLE AND LOWER ALLUVIAL UNITS
SALT RIVER
NOTE: Concentration of TCE at PC-47MA/PC-48MA are based on average concentration for first two years.
EXPLANATION
EXTRACTION WATER WELL LOCATION AND IDENTIFIER
PRODUCTION WATER WELL LOCATION AND IDENTIFIER
INACTIVE PRODUCTION WATER WELL LOCATION AND IDENTIFIER
NORTH INDIAN BEND WASH AREA
MARICOPA COUNTY, ARIZONA
CONCENTRATION OF TCE IN LOWER MIDDLE ALLUVIAL UNIT WELLS
APRIL 1995
FIGURE

FIGURE 6

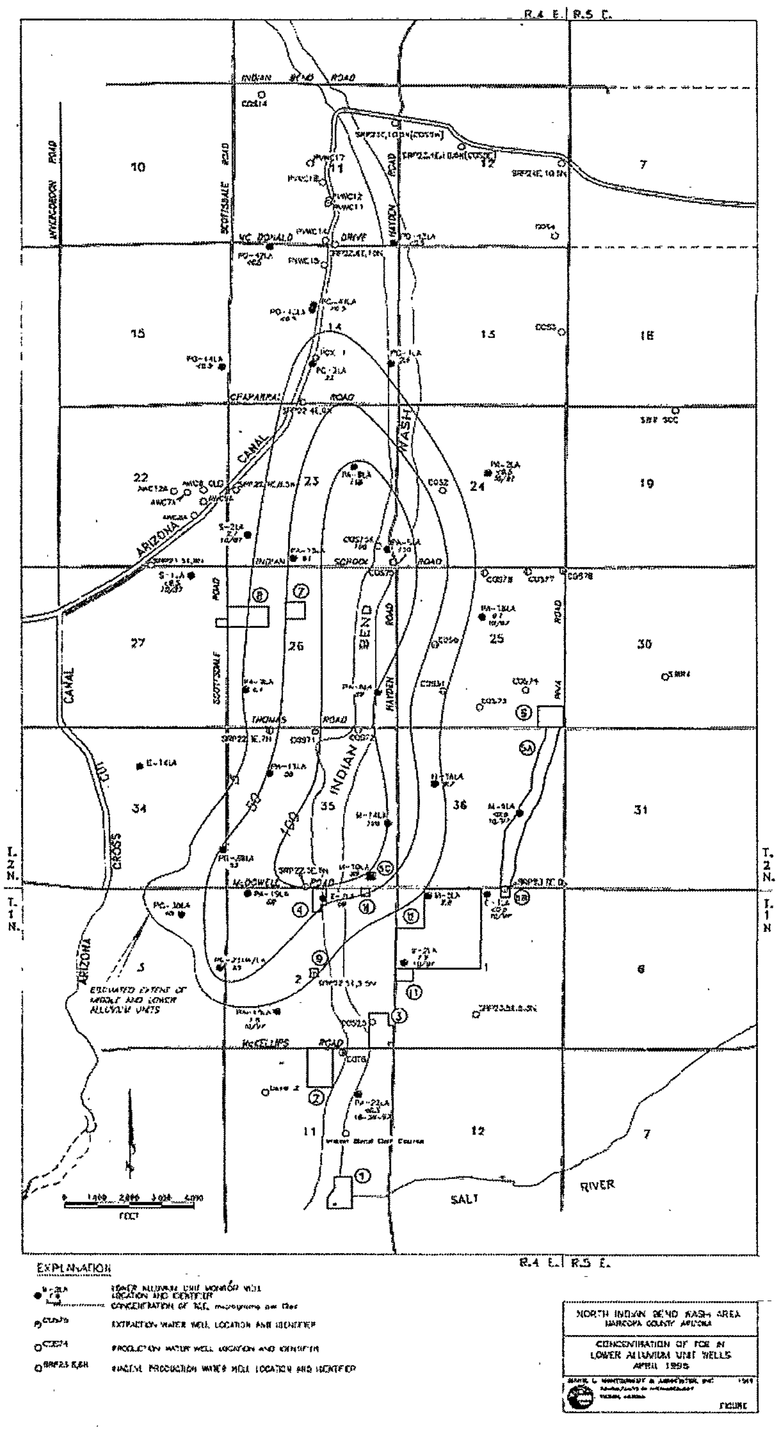

R.4 E. R.5 E.
INDIAN BEND ROAD
SCOTTSDALE ROAD
HAYDEN ROAD
MC DONALD DRIVE
CHAPARRAL ROAD
INDIAN SCHOOL ROAD
THOMAS ROAD
McDOWELL ROAD
McKELLIPS ROAD
ARIZONA CANAL
ARIZONA CROSS CUT CANAL
INDIAN BEND WASH
SALT RIVER
50
100
T. 2 N.
T. 1 N.
EXPLANATION
NORTH INDIAN BEND WASH AREA
CONCENTRATION OF TCE IN LOWER ALLUVIUM UNIT WELLS
APRIL 1995

FIGURE 7

VII. Summary of Site Risks

As indicated above, the groundwater at NIBW is used as a drinking water source. There are no potentially significant completed exposure pathways for either human or ecological receptors. However, if anyone were to be exposed to present contamination levels in groundwater this exposure would pose a risk to individuals that exceeds EPA's acceptable cancer risk range. The response action selected in this ROD Amendment is necessary to ensure continued protection of public health, welfare and the environment from actual or threatened releases of hazardous substances into the environment.

It should be noted that because this document is a ROD Amendment, EPA guidance does not require the level of detail that would be contained in a ROD. However, since it has been quite some time since the first two RODs were issued for this site (1988 and 1991), EPA believes it is important to provide a summary of risk-related information in this ROD Amendment. This information is provided below. Since the focus of this ROD Amendment is groundwater, the majority of information on risk is based on the *Public Health Evaluation* which is included as part of the Operable Unit Feasibility Study for Remediation of Groundwater in the Southern Scottsdale Area (OUFS). This document is dated April 1988 and can be found in the Administrative Record for this site.

A. Summary of Human Health Risk Assessments

Risk assessments were performed for both OU I and OU II. The risk assessment conducted for OU I concluded that the highest potential cancer risk would have been approximately 3.8×10^{-5} if water from contaminated supply wells within NIBW was served to individuals without treatment. The risk assessment for OU II concluded that the greatest risk associated with contaminated soil was impact to groundwater. The other risk assessed was direct contact to contaminated soil which was found to pose only a minimal risk. Thus, soil cleanup actions were taken at specific areas of NIBW because it was determined that VOCs in the soil, if left unaddressed, would contribute to the groundwater contamination. At this time, the soil cleanup is nearly complete, eliminating the possibility of exposure to workers or residents to contaminants in soil as well as eliminating the future impact to groundwater.

The conclusions reached in the OU I and OU II risk assessments are still valid and a new risk assessment was not conducted for this ROD Amendment. Actual human exposure to the contaminants in groundwater at NIBW potentially occurred before the Scottsdale drinking water wells were found to be contaminated in 1981. Since those drinking supply wells were taken out of service, there has been no long-term human exposure to the contamination in the groundwater.

However, EPA's risk assessment policy requires evaluation of the *potential* risks associated with individuals drinking water from the contaminated aquifer for an extended period of time. Therefore, risk assessments evaluate the human health risks from hypothetical exposure to groundwater by future residential receptors if no action (e.g., treatment) were taken. Risk assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action.

B. Identification of Contaminants of Concern - The COCs are all VOCs and are the same for both groundwater and soil. The COCs are identified in Table 1 on page 12.

C. Exposure Assessment

If groundwater contaminated with VOCs is used as a drinking water source, exposure to VOCs could occur via several pathways. These pathways include: (1) ingestion; (2) dermal contact while showering/washing; and (3) inhalation of volatiles. At the time the risk assessment was conducted, there were significant uncertainties associated with quantifying the inhalation and dermal contact exposure routes. Therefore, only ingestion was considered when calculating risks.

At the time the risk assessment was conducted, there was no significant human exposure to the contaminated groundwater at levels of concern. This remains the case today. The wells were taken out of service when the VOCs were discovered. However, worst case conditions were assessed which assumed that the City of Scottsdale (the City) would , under certain circumstances, be forced to use untreated contaminated water.

1. *Exposure Scenarios*

The City would not supply water for potable use that is known to contain VOCs in excess of drinking water standards. However, for the purposes of developing quantitative estimates of risks associated with the ingestion of water from the contaminated wells, hypothetical exposure scenarios were assumed. The following two exposure scenarios were evaluated:

a. It was assumed that untreated groundwater from the four inactive wells would be consumed for three months per year throughout an individual's 70-year lifetime; and
b. It was assumed that untreated water from the contaminated wells would be consumed for 12 months per year for 50 years.

2. *Exposure Levels* - Under both of these scenarios, maximum observed concentrations were selected for risk characterization because of limitations in the data base of the contaminated wells. There was not an adequate amount of data to support averaging the sample results over time.

D. Toxicity Assessment - A toxicity assessment, similar to what would be conducted in risk assessments today, was not conducted in the *Public Health Evaluation* for NIBW. The *Public Health Evaluation* presented a summary of the toxicity of each of the COCs. This information was compiled based on information available at the time including: Health Effects Assessments and Health Advisories. Table 2 on page 23 identifies what was known as the "critical toxicity values" that were used for risk characterization at NIBW. These values include: Acceptable Chronic Intakes (ACI) for non-carcinogens and Carcinogenic Potency Factors for carcinogens. All values in Table 2 are based on ingestion (oral). There are values for inhalation, however, these values are not relevant to the risk characterization that was conducted for NIBW.

Table 2: Critical Toxicity Values		
Contaminant	Acceptable Chronic Intake - ACI (mg/kg/day)	Carcinogenic Potency Factor 1/(mg/kg/day)
Trichloroethylene	N/A[3]	1.1×10^{-2}
Tetrachloroethene	2×10^{-2}	5.1×10^{-2}
1,1-Dichloroethene	9×10^{-3}	N/A[4]
Trichloroethane	5.4×10^{-1}	N/A
Chloroform	1×10^{-2}	8.1×10^{-2}

E. Risk Characterization Assessment

The incremental cancer risks associated with each COC were summed to estimate the total risk for the mixture of chemical carcinogens in groundwater. As a result, the *Public Health Evaluation* for NIBW concluded the following. Under exposure scenario 1, the maximum cancer risk equaled 3.8×10^{-5} and under exposure scenario 2, the maximum cancer risk equaled 1.1×10^{-5}.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. The risks are probabilities that are expressed in scientific notation (e.g., 3.8×10^{-5} see above). An excess life time cancer risk of 3.8×10^{-5} indicates that 3.8 (or 4) individuals experiencing a specific exposure has a 4 in 100,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual developing cancer from all other causes has been estimated to be as high as one in three.

The clean-up levels for the COCs for NIBW are listed in Table 3 on page 24. With the exception of chloroform, the cleanup levels are based on Safe Drinking Water Act Maximum Contaminant Levels (MCLs). In the 1991 ROD, groundwater cleanup standards were established for the groundwater left in place. Specifically for chloroform, the selected cleanup standard was 6 ppb which was not the MCL and was based on a one-in-one million excess cancer risk level. Currently, the MCL that EPA uses for chloroform is 100 ppb. EPA believes it is appropriate to continue to use the cleanup standard that was established for chloroform in the 1991 ROD for the following

[3] Although TCE is a group B2 carcinogen (probable human carcinogen), there is no ACI value for TCE.

[4] 1,1-DCE is considered a Group C carcinogen or possible human carcinogen. There is no CPF value associated with 1,1-DCE.

reasons: (1) in most cases the treated groundwater at NIBW will be used for drinking water; (2) with the exception of one well, the levels of chloroform currently present in NIBW groundwater are below 6 μg/l; and (3) the chlorination processes used to disinfect drinking water have the potential to add chloroform to the water before it is distributed to customers.

Table 3: Cleanup Levels for Chemicals of Concern (COC)	
COC	Cleanup Level (MCL*)
Trichloroethylene	5 ppb
Tetrachloroethene	5 ppb
1,1-Dichloroethylene	6 ppb
1,1,1-Trichloroethane	200 ppb
Chloroform	6 ppb

* The cleanup levels in this table are MCLs with the exception of chloroform, as discussed above.

F. Summary of Ecological Risk Assessment - A review of potential ecological receptors concluded there were no significant completed pathways of significance. As described in Section V.A. on page 8, VOCs were detected in the Indian Bend Wash (the Wash) in the early 1980's. The presence of VOCs in the Wash was determined to be a result of groundwater discharge into the ponds that make up the Wash. Groundwater discharge into these ponds was discontinued and subsequent sampling confirmed that VOCs were no longer present. The groundwater does not seep up to the surface or impact the Wash directly. Therefore, there are no known receptors for an ecological assessment.

VIII. Remedial Action Objectives: The Remedial Action Objectives (RAOs) for NIBW are as follows:

A. Restore the Upper, Middle and Lower Aquifers to drinking water quality by decreasing the concentrations of the contaminants of concern (*see* Section V.F., page 12) to below the cleanup standards (*see* Table 3 on page 24);

B. Protect human health and the environment by eliminating exposure to contaminated groundwater;

C. Provide the City of Scottsdale with a water source that meets MCLs for NIBW contaminants of concern (VOCs);

D. Achieve containment of the groundwater contamination plume by preventing any further lateral migration of contaminants in groundwater;

E. Reuse of the water treated at the Site to the extent possible in accordance with Arizona's Groundwater Management Act;

F. Mitigate any soil contamination that continues to impact groundwater; and

G. Provide long-term management of contaminated groundwater to improve the regional aquifer's suitability for potable use.

These RAOs were selected based on the following considerations:

A. The need to restore the groundwater for drinking water use by decreasing VOCs to below MCLs because the groundwater at NIBW is used as a public water supply;
B. City of Scottsdale water supply wells were shut down and Paradise Valley public supply wells were threatened due to groundwater contamination from the NIBW Site;
C. Containment of contaminated groundwater at NIBW is necessary to protect existing public supply wells; and
D. The necessity for effective management of groundwater resources in the state of Arizona.

IX. Description of Alternatives: Seven alternatives were described and evaluated in the November 2000 FSA. During development of the Proposed Plan issued by EPA in April 2001, EPA identified an eighth alternative, Alternative 3A, which is a variation of Alternative 3 found in the FSA. The alternatives are identified below, detailed descriptions of the alternatives follow:

1. No action (also known as "the Required Remedy");
2. The Enhanced Remedy;
3. The Enhanced Remedy plus one new Middle Aquifer extraction well and one new recharge well;

3A. The Enhanced Remedy plus one new Middle Aquifer extraction well and one new recharge well, continued evaluation of groundwater conditions using the groundwater model and contingency actions for Area 7 and Area 12 groundwater plumes;

4. The Enhanced Remedy plus one new Middle Aquifer extraction well and one new Lower Aquifer extraction well;
5. The Enhanced Remedy plus one new Middle Aquifer extraction well and variable frequency drives;

5RR. Alternative 5 with reinjection/recharge.

6. The Enhanced Remedy plus three new Middle Aquifer extraction wells and three new Lower Aquifer extraction wells and a recharge well.

There has been a substantial amount of work completed at the NIBW Site to date. In order to adequately describe the alternatives evaluated in this ROD Amendment, a thorough description of actions previously completed is necessary.

A. <u>Actions Required by the OU I ROD, issued on September 21, 1988</u>

1. *Ground Water Monitoring Program - Installation and Operational Status*
   a. Between March and October of 1990, 23 new monitoring wells were installed including12 new Middle Aquifer wells and 11 new Lower Aquifer wells.
   b. Groundwater elevations and samples have been collected from the 23 wells installed in 1990, as well as from 34 previously existing monitoring wells and 7 previously existing production wells. The third of three required monitoring phases is ongoing.
   c. Pumping data from the 7 existing production wells at NIBW have been compiled and submitted to EPA since inception of the required groundwater monitoring program.

d. Data regarding releases and inflows into the Salt River between Granite Reef Dam and the mouth of the Wash have been compiled and submitted to EPA since inception of the required groundwater monitoring program.

2. *Ground Water Extraction System and Ground Water Treatment Plant - Construction and Operational Status*

a. Establishment and maintenance of a zone of capture within the Middle Aquifer and Lower Aquifer was required by the 1988 ROD. This zone of capture was to be accomplished by extracting groundwater at Wells COS31, COS71, COS72, and COS75[5]. The minimum rate of groundwater extraction was required to average 6,300 gallons per minute (gpm) over each calendar year. Pumping of these production wells began when the Central Groundwater Treatment Facility (CGTF) became operational in 1994. The location of the extraction wells and the CGTF (Scottsdale Treatment Plant) is depicted on Figure 8 below.

b. Construction of a facility to treat groundwater to meet drinking water MCLs for VOCs was required. The CGTF was constructed from September 1992 through January 1994. The CGTF has been operating since 1994 and will continue to operate until the NIBW groundwater cleanup objectives have been met.

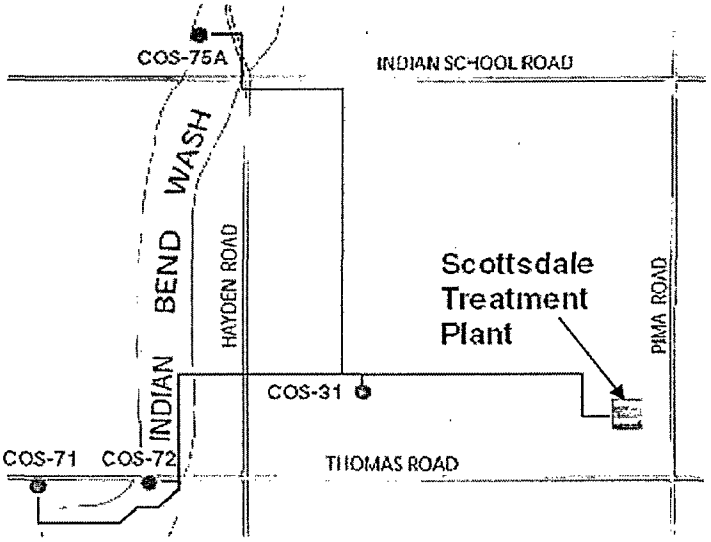


FIGURE 8

[5] These wells were City of Scottsdale wells that already existed at the time of the OU I ROD. These wells were rehabilitated in order to be used as extraction wells for the OU I remedy. Well 75 was subsequently replaced with well 75A.

B. Actions Required by the OU II ROD, issued on September 12, 1991

1. *Expanded Groundwater Monitoring Program for Upper Aquifer - Installation and Operational Status*
   a. Installation of additional monitoring wells to provide for a minimum of one Upper Aquifer monitoring well per 40 acres and a mechanism for monitoring vertical migration of Upper Aquifer groundwater to underlying units within specified areas of Upper Aquifer contamination. A total of 44 new monitoring wells were installed including: 37 Upper Aquifer, 4 Middle Aquifer, 1 Middle Aquifer/Lower Aquifer, and 2 Lower Aquifer monitoring wells in three specified areas of the Site during 1992 and 1993.
   b. Groundwater elevations and samples have been collected from the 44 new monitoring wells, as well as from 28 existing Upper Aquifer monitoring wells.
   c. VOC mass flux estimates have been prepared and provided to the agencies on a periodic basis.

2. *Vadose Zone (Soil) Remediation: Construction and Operational Status*
   a. Construction of a soil vapor extraction (SVE) system at Area 7 was completed in July 1994. SVE activities at Area 7 are expected to be complete by the end of the year (2001).
   b. Construction of an SVE system at Area 8 was completed in September 1995. SVE activities have been completed at Area 8 in accordance with the OU II ROD and the second Consent Decree (1993). This system has been dismantled.
   c. Additional investigations were conducted at Areas 3, 5, 6, 9, 11, and 12. Field investigation data and results of modeling indicated that in all Areas but Area 12, concentrations of VOCs in the vadose zone did not represent a threat to underlying groundwater. EPA did not require vadose zone remediation in Areas 3, 5, 6, 9, and 11.
   d. Construction of the SVE system at Area 12 was completed in September 1996. SVE activities have been completed at Area 12 in accordance with the OU II ROD and the second Consent Decree (1993). This system has been dismantled.

C. Remedy Enhancements

The actions required by both the 1988 and 1991 RODs came to be known as the "Required Remedy." These actions have all been completed or are ongoing (*e.g.*, groundwater monitoring program). Following the construction and initial operation of the Required Remedy, it became apparent that the groundwater contamination in the Middle and Lower Aquifers had not been contained as intended. Specifically, the groundwater plume in the Lower Aquifer was moving to the north and threatening the drinking water supply of the city of Paradise Valley. To prevent the contamination of Paradise Valley wells, the PRPs worked cooperatively with EPA and the State to identify and implement additional actions or "enhancements" that were necessary to achieve capture of the groundwater contamination plume. These actions were completed by the

PRPs on a voluntary basis and have not been documented in a previous record of decision. The enhancements are consistent with the nature and scope of the Required Remedy and have been implemented in coordination with EPA and the State. The Required Remedy together with these additional actions came to be known as the "Enhanced Remedy."

The following remedy enhancements have been completed:

1. Installation of 24 additional monitoring wells (2 in the Upper Aquifer, 1 in the Upper-Middle Aquifer; 16 in the Middle Aquifer, 1 in the Middle-Lower Aquifer, and 4 in the Lower Aquifer)
2. Installation of two new extraction wells to improve capture in the Lower Aquifer;
3. Connection of an additional extraction well to the CGTF;
4. Construction of a new treatment facility for wells in the north to protect the water supply of Paradise Valley. The new treatment facility is known as the Miller Road Treatment Facility (MRTF).
5. Implementation of a soil cleanup action at Area 6 using Soil Vapor Extraction;
6. Construction of groundwater extraction and treatment systems for the Middle Aquifer at Areas 7 and 12; and
7. Upgrades to CGTF columns to enhance performance and reliability of the treatment system.

The following work currently continues to occur as voluntary actions:

1. Continued extraction from wells PVWC-14, PVWC-15 and PCX-1 in the northern portion of the Site (Figure 9 on page 29 depicts the location of the MRTF and wells PVWC-14, PVWC-15 and PCX-1);
2. Continued extraction from Area 7 and 12 extraction wells;
3. Operation of the MRTF to treat the groundwater extracted from the northern part of NIBW;
4. Operation of the Area 7 and Area 12 groundwater treatment systems;
5. Increased frequency of groundwater sampling events and monitoring of the groundwater in the Upper, Middle, and Lower Aquifers; and
6. Collection of additional groundwater monitoring data.

D. Description of Remedy Components

Alternative 1 (no-action): Alternative 1 is the *Required Remedy* and includes all of the requirements of the 1988 and 1991 RODs. The basic components of this alternative include the following: (1) Extraction of the groundwater in the central portion of the Site; (2) Treatment of this extracted groundwater at the CGTF; (3) Treatment of soil using SVE at specific source area locations; and (3) Extensive groundwater monitoring. This Alternative does not contain the migration of the contaminated groundwater plumes, does not meet the Remedial Action Objectives (RAOs), is not protective of human health and the environment, and does not comply with ARARs. Therefore, it is not evaluated further.

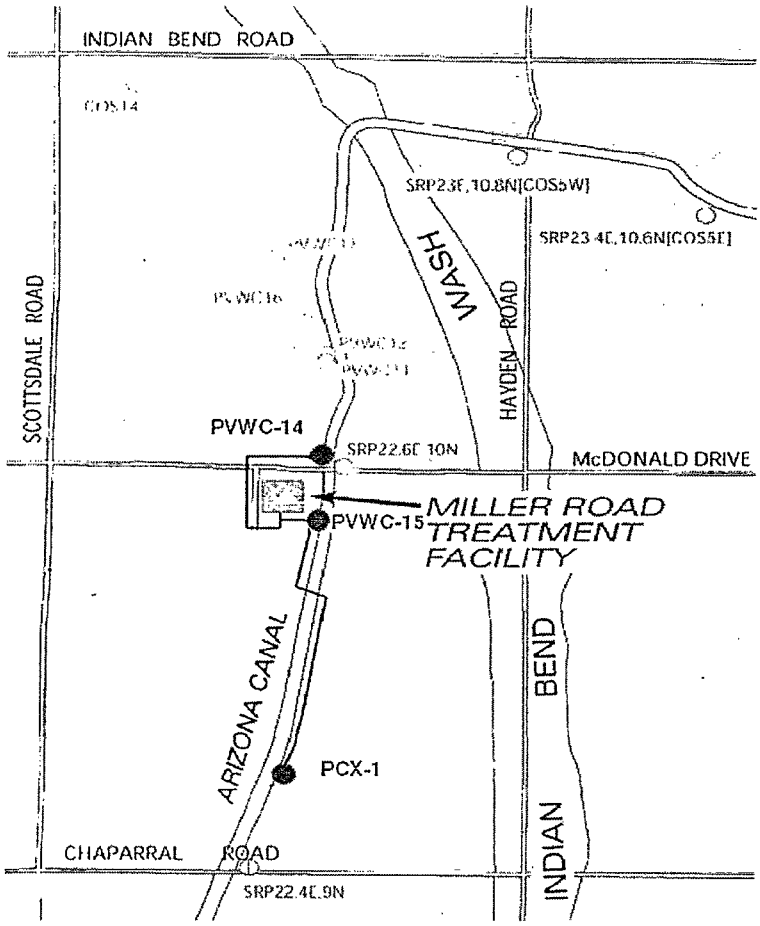


FIGURE 9

Alternative 2: Alternative 2 is the *Enhanced Remedy* and it includes all of the components of Alternative 1 plus the remedy enhancements described in Section IX.C., on pages 27-28. The basic components of this alternative include the following: (1) All components of Alternative 1; (2) Extraction of the groundwater in the northern portion of the Site; (3) Treatment of this extracted groundwater at the MRTF; and (4) Increased groundwater monitoring requirements. As described in Section IX.C., this alternative has been implemented voluntarily by the PRPs in cooperation with EPA and the State.

Alternative 3: Alternative 3 includes all of components of Alternative 2 plus the following:

1. Installation of one new extraction well (7EX-5MA) in the Middle Aquifer. This well will be located in the vicinity of Area 7. The extracted water will be treated at the existing Area 7 groundwater treatment plant;
2. Installation of one recharge well in the Upper Aquifer. This well will be located in the vicinity of Area 7. This new well and the other existing recharge wells near Area 7 accept the treated water from the Area 7 groundwater treatment plant;
3. Groundwater extraction from the Upper Aquifer at Area 7 may be terminated as performance objectives are achieved;
4. The Area 7 treatment plant will be upgraded in order to accommodate increased water production due to the new extraction well (7EX-5MA);
5. The minimum pumping rate for the wells connected to the CGTF (wells COS31, COS71, COS72, and COS75A) will be increased from the current rate of 6,300 gpm to 6,600 gpm. This is a combined annual average pumping rate;
6. A priority pumping scheme will be implemented which includes focused pumping from the most contaminated CGTF extraction wells (COS71 and COS75A); and
7. Spare pumping equipment will be purchased and utilized to maximize production and avoid long down-times at the two most contaminated CGTF wells (COS71 and COS75A).

Alternative 3A: Alternative 3A is a variation of Alternative 3 described in the FSA. For clarification purposes, this alternative is referred to as Alternative 3A. This alternative includes all actions identified for Alternative 3 with the following exceptions and additional actions:

1. With the exception of continued use of the MRTF and wells PCX-1, PVWC-14, and PVWC-15, the voluntary actions (identified in Section IX.C., pages 27-28) will become required actions under Alternative 3A;
2. The goal for minimum total annual average pumping rate will remain at 6,300 gallons per minute for the wells connected to the CGTF;
3. To ensure capture of the groundwater contamination plume, groundwater will be extracted from either wells PCX-1, PVWC-14, and PVWC-15 or wells that are equivalent in location, depth, design, capacity etc.
4. Maintenance of a minimum total annual average pumping rate of 5,480 gpm for wells PCX-1, PVWC-14, and PVWC-15 (or wells that are equivalent in location, depth, design, capacity etc.). This is a combined annual average pumping rate;
5. Treatment of extracted groundwater using air stripping at Area 12, the CGTF and the facility treating groundwater from PCX-1, PVWC-14, and PVWC-15 (or wells that are equivalent in location, depth, design, capacity etc.);
6. Treatment of extracted groundwater using UV-oxidation at Area 7;
7. Treated water and groundwater left in place shall not contain VOCs present above the cleanup standards (*see* Table 3 on page 24);
8. Periodic updating of the groundwater model to ensure that the extraction and treatment part of the cleanup strategy is working as predicted;

9. Localized containment of the groundwater plumes specific to Area 7 and Area 12; and
10. If groundwater data indicates that the Area 7 and Area 12 groundwater plumes are migrating toward the southwest margin, contingency actions, potentially including additional wells or increased pumpage in these areas, shall be evaluated and implemented.

Alternative 4: Alternative 4 is the Enhanced Remedy plus one new Middle Aquifer extraction well, one new Lower Aquifer extraction well, and one new Upper Aquifer recharge well. This alternative includes all actions identified for Alternative 2 plus installation of two new extraction wells and a recharge well. One of these wells will be installed in the vicinity of Area 7 and the extracted water from this well will be treated at the Area 7 groundwater treatment plant. The new recharge well will also be installed in the vicinity of Area 7. The other new well will be installed in the central part of the Lower Aquifer contamination plume and the extracted water from this well will be treated at the CGTF.

Alternative 5: Alternative 5 is the Enhanced Remedy plus one new Middle Aquifer extraction well, one new recharge well, and variable frequency drives. This alternative includes all actions identified for Alternative 2 in addition to the following:
1. Installation of one new extraction well and one new recharge well in the vicinity of Area 7;
2. Use of variable frequency drives to change extraction rates in response to water system demand; and
3. Use of large capacity pumps.

Alternative 5RR: Alternative 5RR is Alternative 5 with reinjection/recharge. This alternative includes all actions identified for Alternative 5 plus an evaluation of the possible effects of reinjection/recharge of the CGTF treated water. This alternative evaluated reinjecting groundwater into both the Upper and Lower Aquifers for control of the plume.

Alternative 6: Alternative 6 is the Enhanced Remedy plus three new Middle Aquifer extraction wells and three new Lower Aquifer extraction wells and a recharge well. This alternative includes all actions identified for Alternative 2 plus installation of six new extraction wells. Two of these wells will be installed in the Middle Aquifer in the vicinity of Area 7, and the extracted water from these wells would be treated at the Area 7 groundwater treatment plant. The new recharge well will be installed in the vicinity of Area 7. One of the other extraction wells would be installed in the Middle Aquifer in the vicinity of Area 12, and the extracted water from this well would be treated at the Area 12 groundwater treatment plant. The other three new extraction wells would be installed in the central part of the Lower Aquifer contamination plume, and the extracted water from one these wells would be treated at the CGTF. Water from the other two wells would be treated at alternate locations.

E. Common Elements and Distinguishing features of Each Alternative: The retained Alternatives (2, 3, 3A, 4, 5, 5RR, and 6) contain the following items:

1. Establishment and maintenance of a zone of capture within the Middle Aquifer and Lower Aquifer;
2. Treatment of all extracted groundwater to meet MCLs;
3. Use of the CGTF, the Area 7 Treatment Plant and the Area 12 treatment plant;
4. Groundwater monitoring in the Upper, Middle, and Lower Aquifers; and
5. Completion of SVE activities at Area 7.

Table 4 on page 33 summarizes unique elements of each of the alternatives. Table 5 on page 34 identifies the 50 year present worth cost of each of the alternatives; the cost to implement each of the alternatives, the number of new extraction wells per alternative, and the estimated percentage of mass removed from the groundwater after 50 years of remedy operation.

X. Summary of Comparative Analysis of Remedy Alternatives:

In accordance with the NCP, the alternatives are evaluated using the nine criteria. A summary of the comparative analysis of the alternatives can be found in Table 7 on page 39. For an alternative to be acceptable it must pass EPA's two threshold criteria: (1) Overall Protection of Human Health and the Environment; and (2) Compliance with Applicable, Relevant and Appropriate Requirements (ARARs). As described in Section IX.D. on page 28, Alternative 1 is not protective and does not comply with ARARs and is therefore not discussed in this section.

A. Overall Protection of Human Health and the Environment: All of the remaining alternatives (Alternatives 2, 3, 3A, 4, 5, 5RR and 6) are protective of human health and the environment and eliminate, reduce, or control risks posed by the contamination at NIBW through treatment.

Due to the failure of the remedy selected in the 1988 ROD to contain the plume, voluntary actions (described in Section IX.C., Remedy Enhancements, on pages 27-28) were taken to ensure protection of human health and the environment. Alternative 3A makes these voluntary actions required. The remaining alternatives indicate that the Remedy Enhancements would continue to be implemented on a voluntary basis. Therefore, such actions could potentially be discontinued at any time. By requiring continued implementation of the voluntary actions under Alternative 3A, EPA is ensuring that the remedies currently in place will continue to operate. This makes Alternative 3A more protective than the other alternatives.

B. Compliance with ARARs: All the remaining alternatives (Alternatives 2, 3, 3A, 4, 5, 5RR and 6) would comply with ARARs.

Table 4 - Summary of Unique Elements of Alternatives	
Alternative	Elements
2	• Alternative 2 has no unique elements. All of the other retained alternatives include all of the components of Alternative 2.
3	• An increase in minimum pumping rate goal for the CGTF wells from 6,300 gpm to 6,600 gpm
3A	• Past voluntary actions become required actions.[6] • Optional use of MRTF and wells PVWC-14, PVWC-15 and PCX-1. • Minimum pumping requirement for wells PVWC-14, PVWC-15 and PCX-1 (or equivalent wells). • Updated input to groundwater model. • Localized containment at Areas 7 and 12 including contingency actions.
4	• The installation of one new Lower Aquifer extraction well in the central part of the Lower Aquifer contamination plume.
5	• Use of variable frequency drives to change extraction rates in response to water system demand. • Use of large capacity pumps.
5RR	• Use of variable frequency drives to change extraction rates in response to water system demand. • Use of large capacity pumps. • Evaluation of reinjecting groundwater into both the Upper and Lower Aquifers for plume control.
6	• The installation of two new Middle Aquifer extraction wells and three new Lower Aquifer extraction wells.

[6] Although the descriptions of Alternatives 2 and 3 in the FSA appear to require the previously voluntary actions, this is not explicitly clear. In Appendix M1 (pages M1-2 and M1-3), under the descriptions of Alternatives 2 and 3 the following statement is made: "In addition, voluntary enhancements to all components of the required remedy would be implemented." This statement implies that although the voluntary enhancements would be implemented, they would be implemented on a voluntary basis. Therefore, it is important to make the distinction that under Alternative 3A, the voluntary actions are no longer "voluntary" but are required in accordance with this ROD Amendment.

Table 5 - Summary of General Comparison Information for Each Alternative				
Alternative	50 yr. Present Worth Cost in	Cost to Implement and/or Operate	Number of New Extraction Wells	Estimated Mass of TCE Removed after 50 Years
2	$128,196,600	$61,250,820**	0	93%
3	$132,775,800	$62,738,710	1	95%
3A*	**$132,775,800**	**$62,738,710**	**1**	**95%**
4	$134,215,000	$64,356,695	2	95%
5	$135,217,000	$65,304,605	1	96%
5RR	$146,700,000	$77,958,160	1	96%
6	$171,100,000	$100,842,869	6	96%

* Alternatives 3 and 3A are anticipated to be the same regarding these factors.

** These cost figures represent just operations costs - all construction costs have been incurred.

*** The costs for Alternative 3A will increase if a new treatment plant needs to be built to replace the MRTF and if new wells need to be drilled to replace PVWC-14, PVWC-15, and PCX-1.

TABLE 6: COST COMPARISONS					
	FSA cost estimate:	Cost incurred to date capital + O&M:	50 years present worth cost	Cost to implement and/or operate	Difference between cost to implement & cost of existing remedies
Alternative 2	$128,196,600	$64,610,400	$125,861,220	$61,250,820*	$ 0
Alternative 3/3A	$132,775,800	$ 65,953,700	$128,692,410	$62,738,710	$4,174,490
Alternative 4	$134,215,000	$ 65,953,700	$130,310,395	$64,356,695	$4,449,175
Alternative 5	$135,217,000	$ 65,953,700	$131,258,305	$65,304,605	$6,740,385
Alternative 5RR	$146,700,000	$ 65,953,700	$143,911,860	$77,958,160	$19,393,940
Alternative 6	$171,100,000	$ 65,953,700	$166,796,569	$100,842,869	$42,278,649

* These costs figures represent just operations costs - all construction costs have been incurred.

The provisions of 40 C.F.R. Part 270 of the Resource Conservation and Recovery Act (RCRA) are applicable ARARs for the response actions selected in this ROD.[7] Once it is extracted for treatment, groundwater contaminated with hazardous substances is classified as hazardous waste, and must be managed accordingly. Once the extracted groundwater is treated to MCLs, the groundwater is no longer classified as a hazardous waste. [8,9]

A complete list of ARARs for the response actions identified in this ROD Amendment have been identified in Attachment 1.

C. Long-term Effectiveness and Permanence: All of the retained alternatives (Alternatives 2, 3, 3A, 4, 5, 5RR and 6) would permanently remove known chemicals of concern from the groundwater.

However, some alternatives provide better long-term effectiveness than others. All of the retained alternatives would permanently remove VOCs from the groundwater and would ultimately achieve the RAOs.. Operation and maintenance of the extraction and treatment systems for Alternatives 2 through 6 is designed to restore groundwater to drinking water quality by removing VOCs. Completion of the SVE soil remediation actions for Alternatives 2 through 6 is designed to eliminate additional threats to groundwater quality. Once these cleanup actions are complete, the contaminants will have been removed from soil and groundwater making these alternatives effective over the long-term and permanent.

During the cleanup process, groundwater monitoring programs for Alternatives 2, 3, 3A, 4, 5, 5RR and 6 would help EPA evaluate the effectiveness these alternatives. In addition to groundwater monitoring, Alternative 3A will require periodic input of newly collected groundwater data into the existing groundwater model. This will allow for a more thorough analysis of the effectiveness of 3A.

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[7] See U.S. EPA, CERCLA Compliance with Other laws Manual: Interim Final, at 2-4 to 2-7 (EPA 540/G-89/006) (August 1988). The determination that contaminated groundwater, once it is extracted for treatment, must be managed as a state and federal hazardous waste is based on site specific information contained in the Administrative Record. EPA finds that groundwater which is extracted from the site for management and treatment in accordance with this ROD is classified as hazardous waste because the groundwater:

- may contain levels of hazardous substances that meet or exceed state and federal hazardous waste toxicity criteria for specific hazardous wastes (40 C.F.R. Section 261.24); and
- will contain the following RCRA listed hazardous wastes: F001, F002, F003 and D001 (this list is not all inclusive).

[8] See Memorandum "RCRA Regulatory Status of Contaminated Groundwater" from Marcia E. Williams, Director Office of Solid Waste, U.S. EPA, to Patrick Tobin, Director Waste Management Division, U.S. EPA Region IV (dated November 13, 1986).

[9] See Memorandum "Status of Contaminated Groundwater and Limitations on Disposal and Reuse" from Sylvia Lowrance, Director Office of Solid Waste, U.S. EPA, to Jeff Zelikson, Director Toxics and Waste Management Division, U.S. EPA Region IX (dated January 24, 1989).

All of the alternatives include a certain amount of groundwater recharge (into the upper aquifer at Area 7). Because of this it is possible that incomplete treatment could result in reinjection of contaminated water into the aquifers. Since reinjection is contemplated on a much greater scale for Alternative 5RR, the risk is greater for this alternative.

Residual risk may be a factor in the length of time to achieve cleanup levels. It is estimated that MCLs will be achieved in all site monitoring wells in the early 2040's for Alternative 6. Within the timeframe contemplated by the groundwater model (before 2050), MCLs are anticipated to be achieved in all but approximately ten monitoring wells for the other retained alternatives. However, Alternatives 2, 3, 3A, 4, 5, 5RR and 6 all have the ability to maintain reliable protection of human health and the environment over the long-term.

D. Reduction of Toxicity, Mobility, or Volume Through Treatment: Over time, all of the retained alternatives at NIBW are projected to permanently reduce the toxicity, mobility, and volume of TCE mass through treatment. Despite significant differences in the location and intensity of groundwater extraction activities Alternatives 2, 3, 3A, 4, 5, 5RR and 6 all perform similarly over the long term. However, there are slight variations which are discussed below.

In approximately 50 years, Alternative 2 is projected to remove 93 percent of the TCE mass, Alternatives 3, 3A[10], and 4 are all projected to remove 95 percent of the TCE mass, and Alternatives 5, 5RR, and 6 are all projected to remove 96 percent of the TCE mass.

The area of the plume in the Upper Aquifer is currently estimated at approximately 1.3 square miles. Alternatives 2, 3, 3A, 4, 5, 5RR and 6 are all expected to take approximately 30 years to reduce the area of the plume in the Upper Aquifer to zero.

The area of the plume in the Middle Aquifer is currently estimated at approximately 3.1 square miles. The following plume area projections are based on a full fifty years of remedy operation. The area of the plume in the Middle Aquifer is projected to be 1.1 square miles for Alternatives 2 and 4. For Alternatives 3, 3A, 5, and 5RR the area of the plume in the Middle Aquifer is projected to be 1.0 square miles. For Alternative 6 the area of the plume in the Middle Aquifer is projected to be 0.8 square miles.

The area of the plume in the Lower Aquifer is currently estimated at approximately 4.5 square miles. After a full fifty years of remedy operation the area of the plume in the Lower Aquifer is projected to be 0.2 square miles for Alternative 2 and 0.1 square miles for Alternatives 3 and 3A. The area of the plume in the Lower Aquifer is expected to be zero in approximately 2048 for Alternatives 4 and 5, in 2040 for Alternative 5RR and in 2037 for Alternative 6.

E. Short-term Effectiveness: None of the alternatives considered are truly short-term remedies. All of the alternatives in this ROD Amendment require long-term (approximately 50 years) operation of various extraction and treatment systems in order

[10]A scenario for Alternative 3A was not evaluated in the groundwater model. However, Alternative 3A's performance is expected to be comparable to that of Alternative 3.

to meet the RAOs.

Potential danger to workers and to the environment during the implementation of Alternatives 3, 3A, 4, 5, 5RR and 6 would be higher than for Alternative 2 because of the need to install additional extraction and recharge wells. This short term risk would be greater for Alternatives 5RR and 6 because significantly more wells would be installed with these alternatives. Such short term risks can be minimized by adherence to established health and safety practices and standard engineering controls.

Each of the Alternatives 3, 3A, 4, 5, 5RR and 6 would be effective in the short-term while remediation goals are being achieved. As mentioned above, none of the alternatives considered are truly short-term remedies. All of the alternatives would require operation and maintenance for approximately the same amount of time.

F. Implementability: All of the retained alternatives use proven technologies that would be possible to implement, although there are some significant implementation issues associated with Alternatives 5, 5RR, and 6.

The remedial actions proposed under Alternative 2 have already been fully implemented. Therefore, it has been demonstrated that Alternative 2 is technically and administratively feasible. Since Alternative 2 requires no additional work, it the easiest alternative to implement.

Alternatives 3, 3A, 4, 5, 5RR, and 6 include installation of one extraction well, connection of this well to the existing Area 7 treatment facility, modification of the facility to accommodate the additional groundwater, and installation of a new recharge well. Although these modifications could be designed and completed relatively easily and in a reasonable time frame, such modifications make these alternatives more difficult to implement than Alternative 2.

Currently, the owner/operator of the MRTF where water from wells PCX-1, PVWC-14, and PVWC-15 are treated is not a party to either the first or second CDs. Such a situation does not provide EPA with the following: (1) the CERCLA authority to oversee and direct operations at the plant as needed to protect human health and the environment; and (2) the authority ultimately enforce the this ROD Amendment's requirements to extract and adequately treat the groundwater in the northern part of the Site in order to contain the plume and restore the aquifer. Alternative 3A makes the use of the MRTF, PVWC-14, PVWC-15 and PCX-1 optional. This allows for flexibility in the implementation of the remedy that none of the other alternatives provide. EPA believes that this makes Alternative 3A potentially easier to implement than the remaining alternatives.

Alternative 4 requires installation of one extraction in the Lower Aquifer and associated piping. Installation of wells in the Lower Aquifer is moderately difficult making Alternative 4 more difficult to implement than Alternatives 2, 3, and 3A.

Alternatives 5 and 5RR require procurement and installation of new well pumps and variable frequency drives (VFDs). Electrical upgrades would be required for the existing wells, one of which is about 50 years old. Such upgrades could present implementation

issues that are moderate to difficult making Alternatives 5 and 5RR more difficult to implement than Alternatives 2, 3, 3A and 4.

Alternative 5RR would require installation of six new recharge wells at Pima Park, conversion of an extraction well to a reinjection well, installation of over 16,000 feet of pipeline to transport treated water to the recharge wells and the three new reinjection wells along Scottsdale Road. Installation of the new wells would be very difficult from a logistical standpoint because the wells would be located in highly developed residential and commercial areas in south Scottsdale. Such factors make Alternative 5RR more difficult to implement than Alternative 5.

Alternative 6 requires two additional Area 7 extraction wells (as opposed to one in Alternatives 3, 3A, 4, 5, and 5RR) and adding three extraction wells in the Lower Aquifer with associated piping. As mentioned above installation of wells into the Lower Aquifer is technically more challenging than the installation of the shallower wells. Because Alternative 6 calls for three additional deep wells, it is anticipated that Alternative 6 would be the most difficult to implement.

G. Cost: The cost estimates in Table 6 on page 34 are not the estimates identified in the FSA. In the FSA, costs were estimated for each alternative based on the sum of the amount of money spent to date plus the amount of money to be spent in the future. In order to simplify the comparison of costs, Table 6 breaks the cost estimates down into the following: (1) the cost estimate in the FSA; (2) all costs incurred to date - which includes capital and O&M costs; (3) 50 years present worth cost; (4) cost to implement and/or operate the remedy starting now; and (5) the difference between the cost to implement/operate the remedies evaluated in the FSA minus the cost to implement/operate currently existing remedies.

As described previously in this ROD Amendment, Alternative 2 has already been constructed and operations and maintenance (O&M) costs have been incurred for several years. No additional capital costs will be associated with this alternative. The remaining alternatives have at least some capital costs and the O&M for each alternative is comparable. Assuming that the MRTF, PVWC-14, PVWC-15 and PCX-1 are all utilized, the cost of implementing Alternative 3A is anticipated to be relatively the same as the cost of implementing Alternative 3. The only costs that are currently anticipated to be greater for Alternative 3A than the costs estimated for Alternative 3 are the costs associated with the periodic updates of the groundwater model. Since the groundwater model itself has been developed and the groundwater monitoring costs are included in the estimates, the cost of inputting the data into the model and generating future plume projections is anticipated to be insignificant.

H. State Acceptance: The State of Arizona's Department of Environmental Quality and the Arizona Department of Water Resources both support the selection of Alternative 3A The State agencies do not accept Alternatives 5RR and 6 because they cost significantly more than 3A and do not provide proportionally better protection of human health and the environment or long-term effectiveness.

I. Community Acceptance:

EPA received some feedback from community members, the Community Involvement Group, the PRPs, the City of Scottsdale, SRP, and the Arizona-American Water Company. Although there were several requests for clarification of certain remedy components, the community has generally shown support for EPA's preferred alternative: 3A. Responses to significant and relevant comments received during the public comment period can be found in the Responsiveness Summary which is Part III of this ROD Amendment.

Although we received comments from the community we did not get input on each and every alternative. Therefore, this ROD Amendment does not document the community's acceptance or non acceptance of Alternatives 2, 4, 3, 5, 5RR, and 6.

Table 7 - Comparative Analysis of Alternatives

Criteria	2	3	3A	4	5	5RR	6
Protective	yes	yes	more protective	yes	yes	yes	yes
Meets ARARs	yes	yes	yes	yes	yes	yes	yes
Effective in the Long-Term	yes	yes	more effective	yes	yes	yes	yes
Reduces toxicity, mobility, or volume	eventually	third quickest reduction	third quickest reduction	third quickest reduction	second quickest reduction	second quickest reduction	quickest reduction
Effective in the Short-Term	maybe not	yes	yes	yes	yes	yes	yes
Implementable	yes - already implemented	relatively easy	easiest	relatively easy	difficult	difficult	most difficult
Difference between cost to implement & cost of existing remedies[11]	$0	$4,174,490	$ 4,174,490	$4,449,175	$6,740,385	$19,393,940	$42,278,649
State OK	no	yes	yes	yes	yes	no	no
Community OK	see Section X.I. above	see Section XI. above	generally yes	see Section X.I. above	see Section X.I. above	see Section X.I. above	see Section X.I. above

[11] Cost figures found in Table 6 on page 34.

XI. **Principal Threat Wastes:** The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. This ROD Amendment mainly applies to contaminated groundwater. Contaminated groundwater generally is not considered to be a source material. The soil contamination at NIBW that was considered a source material has been remediated. Therefore, there are no known source areas presently at NIBW and as a result principal threat waste was not considered for this ROD Amendment.

XII. Selected Remedy: Preferred Alternative

Based on current information, EPA is selecting Alternative 3A, which requires groundwater containment in the Middle and Lower Aquifers, restoration of the groundwater to drinking water standards via removal of the COCs, groundwater extraction at Areas 7 and 12, continued groundwater monitoring in the Upper, Middle, and Lower Aquifers, periodic updates to the groundwater model, installation of one new extraction well, and treatment of all extracted groundwater.

The Selected Remedy inherently includes the requirements of the OU I and OU II RODs. Since a majority of this work has been completed, only the components that currently require work to be done are discussed below. The Selected Remedy consists of the following:

- Groundwater monitoring in the Upper, Middle, and Lower Aquifers including the periodic input of current groundwater data into the groundwater model to assess the accuracy over time of model projections in the FSA;
- Groundwater plume containment in the Middle and Lower Aquifers as measured by monitoring of sentinel wells and demonstration of inward hydraulic gradient;
- With the exception of continued use of the MRTF and wells PVWC-14, PVWC-15 and PCX-1, the voluntary actions (identified in Section IX.C., pages 27-28) will become required actions under Alternative 3A;
- Treated water and groundwater left in place shall not contain VOCs present above the cleanup standards (*see* Table 3 on page 24);
- Extraction of groundwater from CGTF extraction wells;
- Operation of the CGTF to treat the groundwater extracted from CGTF extraction wells;
- Implementation of a priority pumping scheme which includes increased pumping from the most contaminated CGTF extraction wells;
- Use of spare pumps to avoid long down-times for CGTF extraction wells (COS71 and COS75A);
- The goal for minimum total annual average pumping rate will remain at 6,300 gallons per minute for the wells connected to the CGTF;
- Extraction of groundwater from wells PVWC-14, PVWC-15 and PCX-1 or wells that are equivalent to these wells in location, depth, design, capacity etc.
- Treatment of the groundwater extracted from wells PVWC-14, PVWC-15 and PCX-1 or wells that are equivalent in location, depth, design, capacity etc.;
- The goal for minimum total annual average pumping rate will be established at 5,480 gallons per minute for the wells PVWC-14, PVWC-15 and PCX-1 (or wells that are equivalent in location, depth, design, capacity etc.);
- Operation of the Area 7 and Area 12 groundwater treatment systems;
- Installation of one extraction well and one recharge well in the vicinity of Area 7;

- Upgrades to the Area 7 treatment plant to accommodate increased production;
- Localized containment of the groundwater plumes specific to Area 7 and Area 12;
- If groundwater data indicates that the Area 7 and Area 12 groundwater plumes are migrating toward the southwest margin, contingency actions, potentially including additional wells or increased pumpage in these areas, shall be evaluated and implemented; and
- Completion of the soil cleanup action currently in progress at Area 7.

Most Superfund remedies that include remediation of groundwater contamination include institutional controls as a component. Institutional controls are administrative mechanisms that EPA uses to prevent installation of drinking water wells into areas of groundwater contamination. This is a complicated issue at NIBW because the plume of groundwater contamination exists beneath numerous private properties.

The potential for the private use of groundwater via domestic wells at NIBW is very small, because potable water is provided by regulated water providers and it is not necessary to drill domestic wells. However, there is a slight possibility that a citizen could unknowingly drill a well into the plume and drink contaminated water. There is also a possibility that a large volume production well could be installed in the area that could affect groundwater movement and, therefore, compromise the effectiveness of the remedy. The ADWR regulates groundwater in the state. All wells drilled in the State of Arizona must be permitted by ADWR. Licensed drillers may not legally drill a well without such a permit. Because all individuals who apply for drilling permits within or near the NIBW site are informed in writing by ADWR that the groundwater is contaminated, this should deter individuals from installing and using domestic drinking water wells. Arizona's Well Spacing and Impact Rules regulate the placement of new and replacement production wells in areas such as NIBW. In accordance with the Well Spacing and Impact Rules, new production wells must be located in such a manner that nearby wells of record, such as the wells used for cleanup activities at NIBW, are not adversely affected. In addition, ADWR regulates well construction so that vertical cross-contamination between aquifers does not occur at sites such as NIBW.

It should be noted that the Selected Remedy will be required to meet the Remedial Action Objectives (*see* Section VIII., page 24). The alternatives evaluated in this ROD Amendment all meet the threshold criteria and any of the alternatives or any combination of components could have been selected. Because it is often necessary during the design and implementation of remedial actions to alter components within the system in order to achieve optimal performance, if it is determined that any of the Remedial Action Objectives are not being met once the Selected Remedy is fully implemented, additional actions could be deemed necessary.

EPA believes Alternative 3A meets the threshold criteria and provides the best balance of tradeoffs among the alternatives. EPA expects the Selected Remedy to satisfy the following statutory requirements of CERCLA Section121(b): (1) to be protective of human health and the environment; (2) to comply with ARARs; (3) to be cost effective; (4) to utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) to satisfy the preference for treatment as a principal element.

A. Summary of the Rationale for the Selected Remedy: The principal factors considered in selecting the remedy were as follows:

1. From the time of the OU I CD, the CGTF extraction wells have had minimum pumping requirements. No such requirements were ever established for the extraction wells currently connected to the MRTF. EPA understands that effective extraction and treatment of the groundwater at NIBW will not be achieved by minimum pumping requirements. However, in order to maintain capture of the plume in the Lower Aquifer, EPA believes that goals for minimum total annual average pumping rates for PVWC-14, PVWC-15 and PCX-1 (or wells that are equivalent in location, depth, design, capacity etc.) are necessary. Alternative 3A is the only alternative that includes such requirements.

2. EPA worked cooperatively with the PRPs and the state to identify and implement the *remedy enhancements*. For enforcement purposes, it is important for the previously voluntary actions to become required actions as part of the Selected Remedy in this ROD Amendment. Alternative 3A is the only alternative that includes this requirement.

3. It is important for EPA to select a remedy that is effective and feasible to implement. Currently, the owner/operator of the MRTF is not a party to either the first or second CDs. Because the use of wells PVWC-14, PVWC-15, and PCX-1 (or the equivalent) is an integral and essential part of groundwater containment at the NIBW Site, this situation does not allow EPA to effectively oversee and direct the implementation of the Selected Remedy. It is essential for EPA to be able to enforce the remedies selected in RODs, otherwise EPA could not ensure protection of human health and the environment. Alternative 3A makes use of the MRTF, PVWC-14, PVWC-15 and PCX-1 optional. This allows for flexibility in the implementation of the remedy that none of the other alternatives provide. This makes Alternative 3A easier to implement than the remaining alternatives.

4. Groundwater monitoring is essential to the Selected Remedy to ensure that the extraction and treatment systems are effectively containing the plumes. EPA believes it is also important to include the periodic input of current groundwater data into the groundwater model to assess the accuracy over time of model projections in the FSA. Alternative 3A is the only alternative that includes this requirement.

B. Description of the Selected Remedy: The performance standards for the Selected Remedy Alternative 3A are as follows:

1. *Groundwater Monitoring*:
   a. An up-to-date groundwater monitoring and evaluation program (GM&EP) shall be developed.
   b. The GM&EP shall address conditions in the Upper, Middle, and Lower Aquifers.
   c. During the development of the GM&EP the groundwater monitoring

requirements from the OU I and OU II RODs shall be re-evaluated to ensure that such requirements are still relevant.

d. The GM&EP shall include the periodic input of current groundwater data into the groundwater model to assess the accuracy over time of model projections in the FSA and to assess the effectiveness of the Selected Remedy.

e. A GM&EP work plan shall be developed subject to approval by EPA in consultation with ADEQ and ADWR.

f. Once the work plan has been approved, the GM&EP shall replace the existing groundwater monitoring requirements.

2. *Extraction and treatment of groundwater from the central portion of NIBW*:

a. Groundwater shall be extracted from the CGTF extraction wells (COS31, COS71, COS72, and COS75A) to ensure that the groundwater contamination is not migrating to the southwest margin.

b. Groundwater shall be extracted from the CGTF extraction wells in accordance with a priority pumping scheme which includes increased pumping from the most contaminated of the CGTF extraction wells (COS71 and COS75A);

c. The goal for minimum total annual average pumping rate shall be 6,300 gallons per minute for the CGTF extraction wells.

d. The extracted groundwater from the CGTF extraction wells shall be pumped to the CGTF for treatment.

e. Treated groundwater from the CGTF shall meet the cleanup standards in accordance with Section XII.B.7.a., on page 46.

f. Spare pumps shall be purchased and used to avoid long down-times for COS71 and COS75A. In the event that a pump in well COS71 or COS75A fails, a spare pump shall be installed within two weeks of discovery of pump failure.

g. The Operation and Maintenance Plan (O&M Plan) for the CGTF shall be revisited to make sure the plant is in compliance with all requirements of this ROD Amendment.

h. The Remedial Design Work Plan (RDWP) for implementation of the Selected Remedy shall include, but not be limited to, the following:

(a) Identification of sentinel wells to evaluate achievement of capture;

(b) If adequate sentinel wells do not exist then such wells shall be installed; and

(c) Identification of criteria necessary to demonstrate achievement of capture. Such criteria should include, but not be limited to, demonstration of inward hydraulic gradient.

3. *Extraction of groundwater from the northern portion of NIBW*:

a. Groundwater shall be extracted from either wells PVWC-14, PVWC-15 and PCX-1 or wells that are equivalent in location, depth, design, capacity etc. to ensure that the groundwater contamination in the Lower Aquifer is not migrating further to the north.

b. The goal for the minimum total annual average pumping rate shall be

established at 5,480 gallons per minute for wells PVWC-14, PVWC-15 and PCX-1 (or wells that are equivalent in location, depth, design, capacity etc.).

c. The groundwater extracted from wells PVWC-14, PVWC-15 and PCX-1 (or wells that are equivalent in location, depth, design, capacity etc.) shall be treated using air stripping technology. Such treatment may take place at the MRTF, at an alternate location or via the use of wellhead treatment, if feasible.

d. Treated groundwater from wells PVWC-14, PVWC-15 and PCX-1 (or wells that are equivalent in location, depth, design, capacity etc.) shall meet the cleanup standards in accordance with Section XII.B.7.a., on page 46.

e. The O&M Plan for the MRTF (if the MRTF is used as part of the Selected Remedy) shall be revisited to make sure the plant is in compliance with all requirements of this ROD Amendment.

f. The RDWP for implementation of the Selected Remedy shall include, but not be limited to, the following:

   (a) Identification of sentinel wells to evaluate achievement of capture;

   (b) If adequate sentinel wells do not exist then such wells shall be installed; and

   (c) Identification of criteria necessary to demonstrate achievement of capture. Such criteria should include, but not be limited to, demonstration of inward hydraulic gradient.

4. *Extraction and treatment of groundwater at Area 7*:

a. One new extraction well shall be installed in the Middle Aquifer in the vicinity of Area 7[12].

b. One new recharge well shall be installed in the Upper Aquifer in the vicinity of Area 7.

c. Groundwater shall be extracted from Area 7 extraction wells (7EX1/2, 7EX3A-MA, 7EX4-MA, and 7EX5-MA) to ensure that the localized groundwater contamination plume at Area 7 is contained and not migrating toward the southwest margin.

d. Groundwater extraction from the Upper Aquifer at Area 7 may be terminated as performance objectives are achieved, such termination may only occur upon approval by EPA.

e. Contingency actions, including but not limited to, additional wells or increased pumpage at Area 7 shall be evaluated and implemented if groundwater data indicates that the Area 7 groundwater plume is migrating toward the southwest margin.

f. The O&M Plan for the Area 7 groundwater treatment plant shall be revisited to make sure the plant is in compliance with all requirements of this ROD Amendment.

g. The RDWP for implementation of the Selected Remedy shall include,

[12] This well was approved by EPA and has already been installed.

but not be limited to, the following:

(a) Identification of sentinel wells to evaluate achievement of capture at Area 7;

(b) If adequate sentinel wells do not exist then such wells shall be installed. and

(c) Identification of criteria necessary to demonstrate achievement of capture at Area 7. Such criteria should include, but not be limited to, demonstration of inward hydraulic gradient.

h. The Area 7 groundwater treatment plant shall be upgraded to accommodate increased production from the new extraction well.

i. The extracted groundwater from the Area 7 extraction wells shall be treated at the existing Area 7 groundwater treatment plant.

j. Treated groundwater from the Area 7 plant shall meet the clean-up standards in accordance with Section XII.B.7.b., on page 46.

5. *Extraction and treatment of groundwater at Area 12*:

a. Groundwater shall be extracted from Area 12 extraction wells (12M-EX1 and the Granite Reef well) to ensure that the localized groundwater contamination plume at Area 12 is contained and not migrating toward the southwest margin.

b. Contingency actions, including but not limited to, additional wells or increased pumpage at Area 12 shall be evaluated and implemented if groundwater data indicates that the Area 12 groundwater plume is migrating toward the southwest margin.

c. The O&M Plan for the Area 12 groundwater treatment plant shall be revisited to make sure the plant is in compliance with all requirements of this ROD Amendment.

d. The RDWP for implementation of the Selected Remedy shall include, but not be limited to, the following:

(a) Identification of sentinel wells to evaluate achievement of capture at Area 12;

(b) If adequate sentinel wells do not exist then such wells shall be installed. and

(c) Identification of criteria necessary to demonstrate achievement of capture at Area 12. Such criteria should include, but not be limited to, demonstration of inward hydraulic gradient.

e. The extracted groundwater from the Area 12 extraction wells shall be treated at the existing Area 12 groundwater treatment plant.

f. Treated groundwater from the Area 12 plant shall meet the clean-up standards in accordance with Section XII.B.7.b., on page 46.

6. *Soil Cleanup at Area 7*: The Soil cleanup action currently in progress at Area 7 shall be completed in accordance with the OU II ROD, the second Consent Decree (1993), and the work plans previously approved by EPA.

7. *Groundwater Cleanup Standards*

   a. Treated groundwater from the NIBW site that is used as part of a drinking water supply shall be treated to meet the cleanup standards for the contaminants of concern identified in Table 3 on page 24. When operating properly, the current treatment facilities that provide potable water to the public (the CGTF and the MRTF) are consistently treating the contaminated groundwater to non-detect levels without averaging the sampling results.

      (1) If a cleanup standard is exceeded based on the analysis of any single sampling event of the effluent for the CGTF or MRTF (or alternate) EPA and the state shall be notified immediately;

      (2) The RDWP for implementation of the Selected Remedy shall include, but not be limited to, the following:

         (a) Procedures for collection of confirmation of cleanup standard exceedance samples; and

         (b) Definition of measures that must be taken to ensure that the plant (or specific treatment tower) is operating properly.

   b. Treated groundwater from the NIBW site that is discharged to a surface water body or used to recharge the groundwater shall be treated to meet the substantive requirements of National Pollution Discharge Elimination System (NPDES) permits or Underground Injection Control Program requirements.

   c. Discharge of water pumped from an aquifer at NIBW that does not meet Arizona aquifer water quality standards and is put to beneficial use other than drinking water should meet the Health-Based Guidance Levels (HBGLs) identified in the Second Draft, Health-Based Guidance Levels for Specific End-Uses of Remediated Groundwater, Arizona Department of Health Services, June 1998.

   d. As established in the 1991 ROD, the groundwater cleanup standards apply to both treated water and groundwater left in place.

8. *Aquifer Restoration*: The Upper, Middle, and Lower Aquifers shall be restored to their beneficial use as a drinking water aquifer.

9. *Plume Containment*: The requirement of plume containment is addressed via individual treatment system above. Contingency actions, including but not limited to installation of additional wells and revised pumping volumes, shall be evaluated and implemented if groundwater data indicates that containment has not been achieved in the Middle Aquifer, the Lower Aquifer, at Area 7 or at Area 12.

10. *Communication Plan*: A communication plan shall be developed that will outline the public notification requirements in the event that there is a malfunction at either the CGTF or the MRTF (assuming the MRTF is utilized as part of the remedy). This plan will specifically address incidents that result in water containing VOCs greater than the MCL being released into public drinking water supplies. This communication plan will be subject to EPA approval. This requirement is included based on comments received during the public comment

period.

C. Summary of the Estimated Remedy Costs:

The estimated cost for the Selected Remedy Alternative 3A is detailed in the Table 8 on page 47. The costs are broken down into: incurred capital costs, projected capital costs, projected future capital cost (present worth), projected annual O&M, and 50 Years future O&M (present worth).

Table 8: Alternative 3A Cost Estimate

Description	Cost
INCURRED CAPITAL COSTS	
Incurred monitoring capital costs	$ 7,107,000
Incurred extraction and treatment capital costs	$ 20,822,300
Incurred source control capital costs	$ 8,087,000
Incurred O&M costs	$ 29,937,400
Subtotal	$ 65,953,700
PROJECTED CAPITAL COSTS	
Installation of extraction well (Area 7)	$ 294,375
Upgrades to Area 7 groundwater treatment plant	$ 253,375
Administrative costs	$ 265,750
Spare pump costs	$ 87,500
Subtotal	$ 901,000
PROJECTED FUTURE CAPITAL COSTS (present worth)	
Includes upgrades/replacement/rehabilitation of existing equipment	$ 2,135,980
PROJECTED ANNUAL O&M COSTS	
	$ 4,335,100
50 YEARS FUTURE O&M COSTS (present worth)	
	$ 59,701,730
Total Net Present Worth	**$ 128,692,410**

The information in these cost estimate summary tables are based on the best available information regarding the anticipated scope of the remedial alternative. This assumes that extraction of groundwater from the northern portion of NIBW will be accomplished by using wells PVWC-14, PVWC-15 and PCX-1 and the MRTF. If alternative wells and treatment facilities are required, the costs will increase. Changes in the cost elements are also likely to occur as a result of new information and data collected during the

engineering design of the remedial alternative, or as new technologies are tested. Major or significant changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Difference, or a ROD Amendment, as appropriate. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

D. Expected Outcome of the Selected Remedy: The expected outcome of the Selected Remedy is the restoration of the aquifer to beneficial use (drinking water source) after cleanup levels for the contaminants of concern are achieved in an estimated 50+ years. Final cleanup levels for groundwater are provided in Table 3 on page 24.

XIII. Statutory Determinations:

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that, during the implementation and upon completion of, the selected remedial action must comply with applicable or relevant and appropriate environmental standards established under federal and State environmental laws unless a waiver is justified. The Selected Remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following section discusses how the Selected Remedy addresses these statutory requirements and preferences.

A. Protection of Human Health and the Environment: Exposure to contaminated groundwater through drinking water supplies is the area of potential risk. The Selected Remedy will contain and treat the contaminated groundwater plumes to drinking water standards. Since no exposure to site-related contaminants should occur, actual exposure levels will be within the acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and below the Hazard Index of 1 for non-carcinogens.

The remedy will not have detrimental cross-media impacts. Treatment systems will comply with air quality requirements. Treated groundwater will go directly to the water distribution systems, discharged to surface water or used to recharge the Upper Aquifer.

B. Compliance with Applicable or Relevant and Appropriate Requirements: Remedial actions selected under CERCLA must comply with all ARARs under federal environmental laws or, where more stringent than the federal requirements, State environmental or facility siting laws. Where a State has delegated authority to enforce a federal statute, such as RCRA, the delegated portions of the statute are considered to be a Federal ARAR unless the State law is broader or more stringent than the federal law. Applicable or relevant and appropriate requirements are identified on a site-specific basis from information about site-specific chemicals, specific actions that are being considered, and specific features of the site location. There are three categories of ARARs: (1) chemical-specific requirements; (2) action-specific requirements; and (3) location-specific requirements.

Chemical-specific ARARs are risk-based cleanup standards or methodologies which, when applied to site-specific conditions, result in the development of cleanup standards for COCs.

Location-specific ARARs are restrictions placed on health-based concentrations of hazardous substances or the conduct of activities because of the special locations, which have important geographical, biological or cultural features. Examples of special locations include wetlands, flood plains, sensitive ecosystems and seismic areas.

Action-specific ARARs are technology-based or activity-based requirements or limitations on actions to be taken to handle hazardous wastes. They are triggered by the particular remedial activities selected to accomplish a remedy.

The Selected Remedy will comply with all ARARs. The ARARs for actions identified in this ROD Amendment are identified in the attached table.

C. Cost-Effectiveness: In EPA's judgement, the Selected Remedy is cost-effective and represents a reasonable value. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." [Note: NCP Section 300.430(f)(1)(ii)(D)] This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., the alternatives are both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of remedial Alternative 3A was determined to be proportional to its costs and hence this alternative represents a reasonable value for its cost.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies to the maximum Extent Practicable: EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Alternative 3A provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance.

E. Preference for Treatment as A Principal Element: There are no known remaining source materials at NIBW. The Selected Remedy will treat the contaminated groundwater to achieve the cleanup levels. The extraction systems will contain the contaminated groundwater plumes, preventing further migration of contamination. The Area 7 and Area 12 extraction systems will also contain the localized areas of contamination and prevent the plumes from moving toward the southwest margin.

F. Five-Year Review Requirements: Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining within NIBW above levels that allow for unlimited use and unrestricted exposure, but it will take more than five years to attain

remedial action objectives and cleanup levels, a policy review will be conducted within five years of construction completion for NIBW to ensure that the remedy is, or will be protective of human health and the environment.

G. Documentation of Significant Changes: In response to comments received during the public comment period EPA has made the following changes to the remedy:

1. A comment was received that indicated the following: Not all groundwater treatment systems at the site utilized the air stripping technology. This statement is correct, the Area 7 groundwater system uses UV Oxidation to treat Area 7 groundwater. This UV oxidation system was approved by EPA and the ROD Amendment reflects that this is the required treatment technology for Area 7 groundwater.

2. A comment was received that requested more diligent notification requirements in the event that either of the treatment plants experience treatment interruptions (*see* comment I.C.8 on page 59). EPA agrees that notification procedures should be developed that will serve to inform the public as expediently as possible in the event of a treatment interruption. As a result, EPA has included a requirement for a Communication Plan in this ROD Amendment (*see* Section XII.B.10, page 46).

3. The City of Scottsdale pointed out in their comments that due to the increasingly high levels of nitrates in the groundwater at the Site the water treated at the CGTF may not be potable. Therefore, the RAO regarding providing a potable water supply to the City of Scottsdale has been revised as follows: "Reuse of the water treated at the Site to the extent possible in accordance with Arizona's Groundwater Management Act".

4. The PRPs pointed out in their comments that the 1991 Consent Decree identifies a 90-day rolling average for determining exceedances of the treatment criteria. Based on this comment, this ROD Amendment does not require cleanup standard exceedances to be based on a single sampling event. However, it is important to note that:
   a. The community involvement group (CIG) for NIBW has expressed concern on numerous occasions that averaging the results of drinking water samples to measure compliance with MCLs is not stringent enough to protect human health and the environment; and
   b. When operating properly, the current treatment facilities that provide potable water to the public (the CGTF and the MRTF) have consistently treated the contaminated groundwater to non-detect levels without averaging the sampling results.

   Therefore, it is EPA's preference to determine the exceedance of the cleanup standards based on one single sampling event.

5. During a review for consistency with the 1988 and 1991 RODs, it was discovered that the cleanup standard selected for chloroform in the 1991 ROD was not the MCL. Instead the cleanup standard selected for chloroform was 6

μg/l which was based on a one-in-one million excess cancer risk level. EPA has determined that it is appropriate to retain 6 μg/l as the cleanup standard for chloroform (*see* Section VII.E. on page 23).

PART 3: THE RESPONSIVENESS SUMMARY

I. Stakeholder Issues and EPA Responses

The volume of community comments on the NIBW Proposed Plan was moderate. Oral comments were received and recorded at the public meeting held on May 9, 2001. Comments were also provided in writing during the comment period. In general, the public supported the preferred alternative.

All comment letters and the transcript of the public meeting can be found in the Administrative Record. A summary of the relevant comments received and EPA's responses are as follows.

A. Significant questions and comments received during the public meeting

1. Has any connection been established between the contamination found in the groundwater at NIBW and local cases of cancer?

   Response: EPA has not conducted specific cancer studies for the NIBW area. EPA's Superfund program does not typically study cancer incident rates. The Superfund program works to make sure that there is no current exposure to hazardous chemicals that could potentially cause cancer in the future. Other agencies such as the Agency for Toxic Substances and Disease Registry or the Arizona Department of Health Services may be better equipped to study cancer incidences in the area. In cleaning up Superfund sites, EPA focuses on current risk and current exposures that may increase the potential to contract cancer. EPA evaluated the risk for contracting cancer based on exposure scenarios of 70-years.

2. Who is paying for the cleanup?

   Response: The cleanup is primarily being paid for by the Participating Companies: Motorola, Siemens Corporation and Smith-Kline Beecham.

3. What was the concentration of contaminants in the groundwater at the time that the municipal water supply wells were taken out of service?

   Response: The municipal wells that were taken out of service were: 6, 31, 71, 72, and 75. The highest concentration of TCE in these wells near the time that they were shut down was approximately 390 µg/l.

4. One community member was concerned about the effect of the site contamination on the neighboring Salt River Pima Maricopa Indian Community (SRPMIC).

   Response: The comprehensive groundwater monitoring efforts were explained to this citizen. It was clarified that EPA has extensive knowledge of where the contamination is -- it is not located beneath SRPMIC lands. Based on the information currently available to EPA, the groundwater flows from SRPMIC toward the NIBW site eliminating this possibility.

5. One community member was concerned about mercury contamination in the area.

Response: No mercury was detected as part of the NIBW groundwater or soil investigations. Mercury is not considered a site contaminant.

6. One citizen asked if the Phoenix Active Management Area (Phoenix AMA) staff was consulted in EPA's identification of the preferred alternative.

Response: Mason Bolitho from the Arizona Department of Water Resources (ADWR) indicated that ADWR consulted with the Phoenix AMA as part of their review of the proposed plan. ADWR supports EPA's preferred alternative and the Phoenix AMA was in agreement with ADWR's position. ADWR's statements are documented in the public meeting transcript which can be found in the Administrative Record.

7. One citizen asked why EPA's preferred alternative only included one additional well and not three.

Response: As a result of EPA's analysis of the alternatives it was determined that additional extraction wells would not sufficiently increase the degree of protectiveness or effectiveness of the remedy to justify the cost of the additional wells and the disruption that would result from installation of the wells and connection of the wells to various treatment plants.

8. One citizen commented that the Miller Road Treatment Facility (MRTF) did not have adequate controls to ensure that the groundwater was being treated effectively.

Response: There were two incidents in which untreated water was released from the MRTF in February 2001. This occurred in part because of an electrical problem. This electrical problem caused the control system to malfunction. This situation has been fixed and the control system is currently working properly. As part of the Remedial Design efforts for this remedy, EPA will revisit the operating parameters of the CGTF and the MRTF (assuming that the MRTF is used as part of the remedy) to ensure that adequate controls are in place.

9. One citizen mentioned that the community has repeatedly voiced concerns regarding the potential for subsidence as a result of the NIBW remedy.

Response: Subsidence is addressed in Section I.C.9. and Section II. A. of this Responsiveness Summary.

10. One citizen asked for an explanation for the state's rejection of alternatives 5RR and 6.

Response: Mason Bolitho from ADWR explained that the state agencies (ADWR and ADEQ) met to discuss the proposed plan and the alternatives being

evaluated. Together ADWR and ADEQ evaluated the alternatives based on the nine criteria and state requirements. Mr. Bolitho indicated that the additional benefit from alternatives 5RR and 6 did not justify the increased costs. ADWR's statements are documented in the public meeting transcript which can be found in the Administrative Record.

11. One citizen asked what the City of Scottsdale's (COS) position was.

Response: EPA responded that the City had not provided comments on the proposed plan as of the time of the public meeting. City comments were received before the end of the comment period. These comments are addressed in Section I.E. below.

12. One citizen asked if we had changed the boundaries of the NIBW site.

Response: The legal definition of a Superfund site is the area where contamination is detected and the areas where contamination comes to be located. Although EPA started with a specific study area, site definitions are refined as more data is gathered. For sites with groundwater contamination, it is not uncommon for site boundaries to change frequently.

13. The following written comment was received during the public meeting: "I like plan #6".

Response: It is assumed that this commenter is referring to Alternative 6 identified in the proposed plan. Alternative 6 would not sufficiently increase the degree of protectiveness or effectiveness of the remedy to justify the additional cost.

B. Significant questions and comments received from citizens in writing during the public comment period

1. Where are the current drinking water wells located? Are they being threatened?

Response: There are four drinking water wells that are connected to the CGTF. These wells are located within the plume of contamination and are already contaminated. Water from these wells is treated to meet drinking water standards and then blended with water in the City of Scottsdale's (the City) Reservoir 80 before being distributed into the drinking water system. These wells are:

Well 75A - located northwest of the intersection of Indian School and Hayden Road s.
Well 71and Well 72 - located off of Thomas Road west of the intersection of Thomas and Hayden Roads.
Well 31 - located northeast of the intersection of Thomas and Hayden Roads.

There are three drinking water wells that are connected to the MRTF. One of these wells(PCX-1) is located within the plume of contamination and is already

contaminated. The other two MRTF wells are not contaminated. Water from the MRTF wells is treated to meet drinking water standards and distributed into the Arizona-American Water Company's drinking water system. These wells are:

PCX-1: is located along the Arizona Canal, north of Chapparal Road west of Miller Road.
PVWC-14[13]: is located northeast of the intersection of Miller and McDonald's Roads
PVWC-15 : is on MRTF property, 5975 N. Miller Road.

The following active wells are near the Superfund site but outside of the current plume. Based on our groundwater modeling data, these wells are not being threatened. The information that is gathered as part of our ongoing groundwater monitoring program will alert us if any of these wells do become threatened.

Well 74: 8601 E. Earll Drive. This well is immediately to the northwest of the CGTF.
Well 3: 8755 E. Jackrabbit
Well 4: 6030 N. Pima Rd.
Well 11: 8190 Via Paseo Del Norte.
Well 12: 7602 E. McCormick Parkway
Well 14: 7401 E. Indian Bend.
PVWC-11: north of McDonald Drive along the Arizona Canal
PVWC-12: north of McDonald Drive along the Arizona Canal
PVWC-16: north of McDonald Drive along the Arizona Canal
PVWC-17: north of McDonald Drive slightly west of the Arizona Canal

For exact locations of PVWC wells please see Figure 9 on page 29 of the Decision Summary.

2. The location of the Siemens plant depicted on EPA diagrams is incorrect. The Siemens plant was near the corner of Thomas Road and Pima Road. On the map, EPA has it located near Miller Road and Indian School.

Response: There was a source area that was investigated at the northwest corner of Thomas and Pima Roads. This was the MicroSemi site which was referred to as Area 6. Soil cleanup work was conducted at Area 6. However, what is more commonly referred to as "the Siemens plant" is Area 7 and it is located off of 75th Street, not far from the corner of 75th Street and Second Street.

3. EPA mentions the risks for cancer associated with the plume, what about the health risks that are non-cancerous?

Response: The conclusions reached in the OU I and OU II risk assessments are

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[13] PVWC stands for Paradise Valley Water Company. Paradise Valley Water Company is now known as Arizona -American Water Company.

still valid and a new risk assessment was not conducted for this ROD Amendment. Any actual human exposure to the contaminants in groundwater at NIBW occurred before the Scottsdale drinking water wells were found to be contaminated in 1981. Since those drinking supply wells were taken out of service, there has been no long-term human exposure to the contamination in the groundwater. Therefore, there is no cancer or non-cancer effects due to exposure to the plume today. The Public Health Assessment which was conducted in 1988 as part of the Operable Unit Feasibility Study for Remediation of Groundwater in the Southern Scottsdale Area concluded that no non-carcinogenic health risks were expected from exposure to the contaminated groundwater.

4. What treatment technology is being proposed or is being performed for the extracted contaminants?

Response: The MRTF, the CGTF and the Area 12 groundwater treatment plants all utilize air stripping to remove the VOCs from the groundwater. The Area 7 groundwater treatment plant utilizes UV Oxidation.

5. What are the risks from the cleanup technology?

Response: The most common risk of cleanup technologies are based on the construction risks while the treatment units are being built. At NIBW almost all of the remedy has been constructed - therefore such risks are not anticipated.

There are air emissions from the various groundwater treatment plants at NIBW. All of the plants currently comply with federal, state and local emissions standards. The Community Involvement Group had concerns about cumulative risks due to air emissions from the treatment plants. EPA's contractor, CH2M Hill, conducted a study of cumulative air emissions and did not identify any significant risks. Therefore, no risks are anticipated due to the emissions from these plants. he CH2M Hill air emissions study can be found in the Administrative Record. It should be noted that the air stripping technology is widely used at Superfund sites across the country and has been demonstrated to be safe and reliable for removing volatile organic compounds from groundwater.

With all technology, there is the risk of malfunction and human error. Such risks cannot be estimated. EPA handles isolated incidents on a case-by-case basis.

6. How long will the remediation take?

Response: It is estimated that the groundwater cleanup standards will be met in approximately 50 years.

C. Significant questions and comments received from members of the NIBW Community Involvement Group (CIG) in writing during the public comment period: EPA received several letters from individual CIG members. Many of the comments from the individual CIG members identify the same issues. These issues are categorized and summarized below and are all considered to be comments from the CIG group.

Area 7

1. The CIG is concerned with the experimental use of UV oxidation and ozone treatment at the Area 7 groundwater treatment plant.

   Response: Siemens proposed to augment its remediation efforts at Area 7 with installation of an ozone injection system. In 1999, a pilot study and test of ozone injection was conducted. EPA approved this pilot study but has not approved full implementation of the ozone injection system at Area 7.

   The currently used groundwater treatment system at Area 7 utilizes UV oxidation followed by air stripper polishing. Two (soon to be three) Middle Aquifer (MAU) wells and one Upper Aquifer well extract groundwater that is treated at the Area 7 groundwater treatment plant. Treated groundwater is recharged into the Upper Aquifer using a recharge well located approximately 600 feet north of Area 7. The design for the MAU groundwater extraction and treatment system (GWETS) was approved by EPA in December 1997. Construction on the GWETS began in November 1998 and was completed in June 1999. Initial startup operations began in June 1999. At standard flow rates (approximately 370 gpm) the UV Oxidation technology removed approximately 90% of the VOCs from the groundwater. This water is then treated using air stripping. Since the GWETS began regular operation, the air stripping has consistently reduced the concentration of VOCs to less than 0.5 ppb before discharge to the reinjection well. This operational data demonstrates that the UV oxidation technology is effective for treating VOCs in the groundwater at Area 7 at NIBW.

2. Because a new well is being installed at Area 7, the CIG is concerned about the capacity of the Area 7 treatment plant and its ability to treat the groundwater to meet the 5 ppb standard. There is a specific concern regarding the monitoring requirements for the treated water - one CIG member indicated that the water treated at Area 7 should be tested weekly. The CIG wants to be assured that no water above 5 ppb gets reinjected.

   Response: Installation of a new extraction well at Area 7 will increase the flow rates of water to be treated at the GWETS. However, the Selected Remedy also includes upgrades to the Area 7 treatment plant to ensure that the plant can handle the increased volume of water. Following the upgrades and connection of the new well to the system, the plant will undergo a test period in which it will be verified that the plant can handle the increased volume prior to discharge to the reinjection well.

3. The CIG is concerned about the amount of TCE present at the Siemens site that could act as a continuing source of pollution. The CIG specifically asked what the total amount TCE present at the Siemens site is and how long it would take to remove the TCE at the Siemens site.

Response: The only TCE present at the Siemens site (Area 7) that could pose a continuing threat to groundwater is found in soil contamination. This is because the groundwater contamination at Area 7 is not in the form that would allow it to be a continuing source. In other words the groundwater contamination is not a Dense Non-Aqueous Phase Liquid (DNAPL). DNAPLs have a specific gravity greater than one and they are immiscible with water (i.e., they form a separate liquid phase). DNAPLs have a tendency to penetrate the water table and sink into an aquifer where they may slowly dissolve making them a serious source of groundwater contamination. If the contamination at NIBW were characterized as a DNAPL; then the DNAPL itself would be considered a continuing source of groundwater contamination.

In May of 2001, Levine Fricke, Siemens contractor, submitted a document to EPA entitled "Operation and Evaluation Report North Indian Bend Wash - Area 7 Soil Vapor/Groundwater Extraction and Treatment System (June 1999 through December 2000)". This report provides the documentation that the VOC contamination at Area 7 has been reduced as a result of the Soil Vapor Extraction remediation efforts. The report concludes that the soil at Area 7 no longer presents a threat to groundwater, and therefore the soil cleanup is complete. EPA is in the process of reviewing this report. Therefore, the amount of TCE present at the Siemens site is no longer significant because soil remediation efforts have been completed.

Notification Requirements

4. The CIG expressed concern with the notification requirements to EPA, ADEQ, ADWR and the City of Scottsdale when a malfunction occurs at either of the treatment plants that would result in water customers being served drinking water that exceeds 5 ppb TCE.

Response: Notification requirements like the ones described above are operational parameters that are typically addressed during the design of the remedy or development of the operation and maintenance plans. Unlike the situation at NIBW, in most instances EPA is selecting a cleanup action that has not already been implemented. In the past, if situations came up where public notification was appropriate, EPA worked with the Participating Companies and the City of Scottsdale to make sure notice was given to the citizens. EPA understands that the CIG believes that the efforts of the Arizona-American Water Company regarding the latest incidences at the MRTF were inadequate. Operation of the MRTF is not currently governed by a Superfund enforcement document (e.g., a Consent Decree). There are currently no specific notification requirements specified for either the CGTF or the MRTF aside from what is required by the Safe Drinking Water Act. EPA and ADEQ will work with the Participating Companies to address the issue of notification requirements in the

future.

5. The CIG expressed the opinion that the citizens being served this water should be alerted immediately.

Response: See response to I.C.4. above.

6. The CIG indicated that notification to the stakeholders and the CIG should be made when there are any changes regarding:
   A. Implementation of the ROD Amendment;
   B. Implementation of voluntary actions,
   C. Technology for the CGTF or the MRTF; or
   D. Other remedies being implemented by the PRPs[14] or EPA.

Response: The purpose of this ROD Amendment is to select a final cleanup action that is protective of human health and the environment. EPA is aware that the CIG group is interested in continued interaction between EPA and the community. In the past, EPA has always been responsive to the CIG and that will continue to be the case. If situations arise at the Site that require information to be distributed to the CIG, EPA will make the effort to provide the information. In the recent past, several e-mail messages have been sent to the CIG to provide updated information on the operation of well PCX-1. EPA felt it was important to provide this information and will continue to do so on a case-by-case basis. Anyone on the CIG or in the community can call the 800 number (1-800 231-3075 at any time to ask questions, obtain information, or request a meeting. EPA will continue to honor all reasonable requests for information.

Miller Road Treatment Facility (MRTF)

7. The CIG stated the opinion that the community must have assurances that the treatment malfunction at the MRTF was an isolated incident and that protocols have been put into place so that a reoccurrence does not occur.

Response: EPA has monitored the efforts of the Arizona-American Water Company to investigate and correct their control problem. EPA has conducted technical reviews and provided comments on all of the documents that the Water Company submitted to Maricopa County for approval. EPA will continue to monitor the situation just as EPA monitors the operation of the CGTF. EPA intends to revisit and revise as necessary the operating plans for both the CGTF and the MRTF to reaffirm that all of the necessary controls are in place. At this time, EPA believes that the computer systems that monitor the operations at both plants are the best possible systems to ensure that no incidents occur in the future. However, due to the potential for human and mechanical error EPA cannot provide a 100% guarantee that similar incidents will not occur. What we

[14] The term "PRPs" was included in this written comment received by EPA. "PRP" is synonymous with Participating Companies as defined in this Responsiveness Summary (Response to I.A.2.).

can guarantee is that we will be diligent in our efforts to prevent such incidents and advise the community of any significant developments.

8. The CIG stated the opinion that a protocol must be developed to alert the public immediately so that exposed individuals can have an opportunity to use alternative water sources. It was specifically stated that the PRPs (Participating Companies) need to alert the community via radio, TV and newspapers within hours of an accident.

Response: As indicated in the response to I.C.4. above, EPA and ADEQ will work with the Participating Companies to make sure the issue of notification requirements are addressed in the appropriate future planning documents. At the CIG meeting that was held on March 14, 2001, we talked about a "communication plan" that would outline a strategy for getting information dispersed to the community in the event that a similar event occurred in the future. EPA still believes that this is a good idea. Based on this comment, the ROD Amendment includes a requirement for a Communication Plan that will be subject to EPA approval (see Section XII.B.10 on page 46).

Subsidence

9. The CIG indicated that the subsidence issue had not been resolved. Many CIG members talked about the work that has been done by ADWR to measure subsidence in the area. The opinion was expressed that there should be requirements in the ROD Amendment regarding subsidence monitoring.

Response: Subsidence is a technical issue and it is addressed in detail in Section II of this Responsiveness Summary, page 72. However, some of the CIG's concerns are non-technical in nature and are answered as follows. The ROD Amendment itself does not include requirements specific to documentation of subsidence. EPA's goals in selecting a remedy at NIBW are clearly identified in Section VIII on page 24 (Remedial Action Objectives). The main purpose of this ROD Amendment is to ensure that individuals are not at risk due to exposure to contaminated groundwater.

Because the issue of the potential for subsidence due to pumping groundwater at the Site was raised by the CIG group, EPA researched subsidence as part of our alternatives evaluation. It was never EPA's intention to include subsidence-related measures in the ROD Amendment unless it was determined that there was a direct connection between pumping at NIBW and the potential for subsidence. There is no evidence that such a connection exists. A more detailed response including the technical aspects of subsidence is included in Section II of this Responsiveness Summary (page 72).

10. The CIG indicated that EPA along with the PRPs should evaluate increasing the number of reinjection wells in strategic areas to minimize subsidence and aquifer depletion.

Response: As indicated above subsidence is a technical issue and it is addressed in detail in Section II of this Responsiveness Summary (page 72).

MCL Exceedance

11. The CIG indicated that Maximum Contaminant Level (MCL) exceedances should be based on one single sampling event as opposed to a cumulative average.

Response: Please see discussion of this issue on page 50 (Documentation of Significant Changes, item #4). It is EPA's preference to determine the exceedance of the cleanup standards based on one single sampling event.

The ROD Amendment states that if a cleanup standard is exceeded at any of the treatment plants, EPA and the state will be notified immediately. The Remedial Design Work Plan and the Communication Plan (discussed in the response to #8 above) will establish procedures for resampling, measures that will be taken to ensure that any treatment problems are fixed.

Miscellaneous

12. The CIG indicated that sample analysis should be expedited as opposed to holding the samples in the laboratory for over 24 hours.

Response: As long as samples are properly preserved, storage of samples in the laboratory will not affect the analytical results. Due to laboratory scheduling and the volume of samples coming through a laboratory at any given time, it cannot be guaranteed that samples will always be analyzed within 24 hours. Depending on the sample and the purpose for obtaining it, it may not always be necessary to require expedited results. Because it is significantly more expensive to receive 24-hour or 48-hour results, EPA weighs the importance of each sampling event and determines what samples need to be expedited and what samples don't. It typically takes six weeks to receive sampling results from an EPA-contracted laboratory.

13. The CIG indicated that the ROD Amendment should require EPA to hold regular CIG meetings to update the community on the progress of the cleanup. Some members specified annual meetings others requested semi-annual meetings.

Response: As indicated in Section I.C.6. above, the purpose of this ROD Amendment is to select a final cleanup action that is protective of human health and the environment. EPA is aware that the CIG group is interested in continued interaction between EPA and the community. However, the ROD Amendment is not the appropriate mechanism to require CIG meetings. In the past, EPA has always been responsive to the CIG and that will continue to be the case. EPA will make a sincere effort to hold CIG meetings to provide information on significant milestones regarding cleanup activities at NIBW. In addition EPA will issue fact sheets when appropriate, the first of which will be issued soon after this ROD Amendment is signed by EPA.

Anyone on the CIG or in the community can call the 800 number (1-800-231-3075) at any time to ask questions, obtain information, or request a meeting. EPA will continue to honor all reasonable requests for information.

14. The CIG expressed the opinion that regular written correspondence should be maintained between the EPA and the CIG.

Response: Please see EPA's responses in Sections I.C.6 and I.C.13 above.

15. The CIG stated that the following actions should be taken by EPA:
    A. The MCL for TCE should be lowered from 5 ppb to 1 ppb. According the CIG, one of the reasons for this is that the current treatment technology is capable of treating to less than 1 ppb of TCE or non-detect.
    B. Permissible emissions levels for TCE in air should be immediately reduced by a factor of at least two. Currently, air emissions are permitted to contain 2 lbs/day of TCE. and
    C. EPA (or other appropriate federal agency) should sponsor new research on the effects of TCE ingestion and inhalation to determine, verify, or update the appropriate limits for TCE in air and water.

Response: EPA is sensitive to community concern over "acceptable" TCE levels and the effects of TCE. However, these particular issues cannot be addressed through the issuance of any singular decision document such as the NIBW ROD Amendment. EPA addresses these issues on a national level. Research on cleanup standards for air and water is often conducted for years before such changes are made. EPA's Regional offices (like the San Francisco office that has jurisdiction over the NIBW Site) utilizes the tools that we are given by Congress and EPA HQ to help us make the best decisions on a site-specific basis and to help maintain national consistency for all RODs issued by EPA. These tools include the regulations that establish the groundwater cleanup levels (MCLs) and air emission standards.

16. The CIG requested that EPA coordinate the efforts of the state and federal agencies related to the monitoring of groundwater contamination, water level changes, groundwater pumping and land subsidence in and near the NIBW site.

Response: EPA already coordinates the efforts of the state and federal agencies related to the monitoring of and cleanup activities for groundwater contamination at NIBW. Although EPA will receive and review the data regarding water level changes, groundwater pumping and land subsidence, the ADWR has the lead for monitoring these activities in the state Arizona.

D. Significant questions and comments received from the NIBW Participating Companies in writing during the public comment period

General Comment

1. EPA's cost estimates for the proposed remedy conclude "...the cost of implementing Alternative 3A is anticipated to be the same as implementing Alternative 3." The Participating Companies suggest that certain elements of Alternative 3A will incur additional costs. Until actual final details of some of EPA's proposed requirements are known, these costs cannot be estimated accurately, but they could be significant.

   Response: Without knowing what specific elements of the cost of Alternative 3A the Participating Companies are concerned with, EPA cannot provide a response to this comment.

Specific Comments

2. The MRTF and the three associated wells are an integral part of the remedy. There is no realistic alternative to these elements. The Participating Companies have developed binding agreements with both the Arizona-American Water Company (Arizona-American Water Company) and the Salt River Project (SRP), for operation of the MRTF and well PCX-1 as part of the remediation program. The Participating Companies agreement also covers pumping and treatment as needed for wells PVWC-14 and 15. Arizona-American Water Company and SRP have also entered into binding agreements regarding treatment and use of water from well PCX-1.

   Response: EPA agrees that the MRTF and the three associated wells are an integral part of the NIBW groundwater remedy. However, Arizona-American Water Company - the owner and operator of the MRTF -- has indicated to EPA on many occasions that they do not believe that the MRTF and associated wells are part of the remedy at all. Arizona-American Water Company has further indicated that they are not interested in signing a consent decree with EPA for the operation of the plant. Unless some entity takes responsibility for operation of the MRTF and these wells in a consent decree with EPA, then these components cannot be part of the final Superfund remedy at NIBW. It is not EPA's preference to abandon the use of the existing equipment. However, Arizona-American Water Company's stance has made using the plant and the wells an unfavorable option to EPA. EPA is aware of the agreements that are in place between the Participating Companies, Arizona-American Water Company and SRP. However, EPA is not a party to these agreements. Therefore, the existence of such agreements does not provide a legal mechanism to ensure EPA's enforcement authority over operation of the Superfund remedy at NIBW.

3. Pumping goals should not be linked to remedy requirements. Remedial system pumping schedules should be used in ways that are most beneficial to achieving remedial goals while also meeting water user end-use criteria. Remedial goals

are to control and capture VOC contamination while managing the long-term usability of the regional aquifer. Extraction and treatment strategies have to be flexible to meet remediation objectives. Pumping a fixed volume of water for an open-ended period of time is not an appropriate remedial objective.

Response: Pumping a fixed volume of water for an open-ended period of time is not one of the remedial action objectives. At the time of the first consent decree, a minimum annual average pumping goal was established for the wells connected to the CGTF. These requirements are "goals" and treated as such. The groundwater model that demonstrates capture of the plume at this point in time identified a certain amount of water being pumped from the northern wells. Therefore, minimum total annual average pumping rate goals are identified in the ROD Amendment. EPA evaluates the effectiveness of operating Superfund remedies at least every five years. If it can be demonstrated in the future that plume capture and aquifer restoration can be achieved at a lower rate of pumping and there were no other complicating factors, then the minimum annual average pumping goal may be adjusted accordingly.

4. All extracted water does not have to be treated, and air stripping is not the only treatment technology used at the site. Some pumping of wells that do not show any detectable levels of VOCs is being done now for hydraulic control and plume management (e.g. PVWC-14). Based on current trends and model predictions, TCE concentrations in some wells in the central area are expected to decrease significantly to the point they may be pumped without treatment if water demands continue to require their use. COS-6 is a case-in-point. Although COS-6 has been disconnected from the COS municipal system it has been pumped by SRP for irrigation water supply during the current, severe drought. SRP operates COS-6 (SRP 23.3E-7.5N) without treatment under their general NPDES Permit and confirms that TCE concentrations continue to decrease as evidenced by a level of 1.6 ppb TCE reported in April 2001. Also, new technologies may be developed that prove advantageous (note that the Area 7 treatment plant is planning to use UV-oxidation and ozone destruction of VOCs). Finally, at some time in the future other, more cost-effective technologies might be introduced as conditions change (e.g. use of liquid-phase carbon for treating wells with low VOC concentrations).

Response: EPA agrees that not all water pumped at the Site needs to be treated and the ROD Amendment has been written to reflect this. In Section XII.B. (starting on page 42) the specific wells that will be connected to each of the treatment systems are identified.

EPA agrees that air stripping is not the only technology being used at the Site. The ROD Amendment specifies that UV Oxidation shall be used to treat the extracted water at Area 7 prior to air stripping.

It should be noted that EPA has not approved full scale implementation of the ozone treatment at Area 7. Any new technology that might be discovered after this ROD Amendment has been issued would require a change to this ROD Amendment in order to be implemented at NIBW.

5. MCL violations should not be defined based on exceedance of 5 ppb TCE in a single sampling event. The OU-I Consent Decree standard for the CGTF specifies a 90-day rolling average, and originally contemplated monthly samples. The concept of averaging water quality data over a specified monitoring interval is inherent in regulations derived from the Safe Drinking Water Act and consistent with the purpose of establishing protective water quality standards for chronic exposures. Currently, sampling is to be done weekly for the next two years, then decreasing to a monthly frequency. Monthly sampling is also the current procedure at the MRTF.

   Response actions, as already defined in the various Operations and Maintenance documents for all the existing treatment facilities, will always be undertaken whenever a single effluent sample exceeds 5 ppb TCE. The response actions may include a number of potential operational measures such as verification of plant operational parameters, confirmation of analytical QA/QC, resampling and expedited testing of treated water, adjustment to influent make-up, modification to treatment system processes, or blending of other water sources with treated water.

   Response: EPA has considered this comment. Please see Section XII.G.4 on page 50.

   Your comment indicates that the various O&M plans require that "Response actions...will always be undertaken whenever a single effluent sample exceeds 5 ppb TCE". EPA agrees. Details regarding such response actions will be documented in the RDWP.

   It should also be noted that, the treatment technologies at both NIBW treatment plants currently have no difficulty consistently treating the groundwater to below the cleanup standards in Table 3, page 24 of the Decision Summary.

6. Monitoring well data, not periodic model updates, provides the most direct and meaningful measure of remedy performance into the future. The NIBW Site has an extensive monitoring well network and comprehensive database of historical water level and water quality monitoring. The monitoring data represent a far more systematic and reliable indicator of remedy performance than can be obtained using projections from even the most complex and finely calibrated contaminant transport model.

   Response: EPA agrees. The ROD Amendment requires groundwater monitoring to evaluate the effectiveness of the remedy.

7. The NIBW groundwater flow and transport model was developed in the FSA process to evaluate differences between projected remedy performance for a range of extraction and treatment strategies. In the future, it may be instructive to compare model predictions to actual groundwater monitoring data to test our conceptual model and substantiate conclusions drawn from the model for the selected site remedy. Updates to the NIBW model, consisting of input of current pumping data, may be appropriate if there are widespread, negative variations in

model projections compared to future groundwater monitoring results.

Response: EPA believes that inputting current data into the NIBW model will be just one more tool to ensure that the remedy is working effectively. That's why the ROD Amendment requires such input.

8. Source control programs for Area 7 and 12 are intended to reduce local VOC contaminant mass. Under the current remedy and the future plans, these programs concentrate on capturing and reducing the larger concentrations of the observed MAU mass near the original source areas. These programs were never designed to or intended to prevent all VOC migration within the MAU. Overall containment of VOC contamination in the NIBW Site is accomplished by managed pumping of large volumes of contaminated groundwater from extraction wells tied into the CGTF and the MRTF. Thus, the MAU mass outside of the Area 7 and 12 capture zones will be addressed through the regional groundwater remediation program. The source control programs are intended to make major, but not complete, mass reductions and therefore reduce the time required to restore the Site. The complexity of the regional groundwater system makes it certain that not all local concentrations can reasonably be contained at any given location.

   Response: The source control programs at Area 7 and Area 12 were implemented as voluntary actions. Your comment indicates that the source control programs in these areas concentrate on capturing and reducing the larger concentrations of the observed MAU mass near the original source areas, so capture was at least considered during the design of these systems. Whether or not these systems were originally designed to maintain capture at Area 7 and Area 12 does not preclude capture from being a requirement of this ROD Amendment.

9. MAU groundwater plumes down gradient of Area 7 and 12 are migrating to the southwest margin and will be addressed through the regional remediation program. Regional pumping stress induces movement of MAU water within the NIBW Site to the southwest margin where it enters the LAU. Consequently, a portion of the MAU plumes beyond the capture zone of MAU extraction wells at both source areas will continue to migrate to the southwest margin. As stated in the preceding comment, the MAU groundwater source control programs are intended to more efficiently extract VOC mass from the regions of larger VOC concentrations that would otherwise move slowly to regional extraction wells. Groundwater monitoring data will provide an on-going mechanism to evaluate and assure attainment of source control program objectives at both Area 7 and Area 12. If source control objectives are not being achieved, contingency measures will be selected and implemented.

   Response: No response necessary.

E. Significant questions and comments received from City of Scottsdale (the City) in writing during the public comment period

1. *Water Provider Responsibilities*

As with any CERCLA study area, the principal focus of the NIBW site is, of course, remediation. While the parties focus on these expected Superfund efforts, the City believes simultaneous consideration must also be given to balancing remediation with other ongoing activities within NIBW.

The City is required to meet its varying customer demands for potable water supplies by continually accounting for, treating, and delivering other water supplies, in addition to groundwater sources. These supplies include Central Arizona Project and Salt River Project surface water sources.

The City must also operate its drinking water system, including its operation of the CGTF under the current Consent Decree, subject to the changing requirements of the Safe Drinking Water Act, 42 USCA §§ 300f, *et seq.* The well-publicized primary SDWA standard for arsenic is certain to be revised in the near future. In addition, the presence of inorganic constituents in the NIBW production wells had not been historically documented until water withdrawn from these wells increased with operation of the CGTF. This degradation of water quality by inorganic constituents now requires blending with other sources. As a result, since 1994 the City has been continually monitoring and revising its water production in order to comply with its County approved Nitrate Blending Plan for Sources Supplying Reservoir 80.[15]

The City's goal has been and continues to be providing water of the best quality to its citizens. To that end, the City, in cooperation with the Participating Companies, has contributed hundreds of thousands of dollars in CGTF column improvements over the past few years. As a result, the CGTF now consistently produces water at levels of TCE below detection limits. The City intends to continue to operate the CGTF consistent with the performance level resulting from this commitment.

Neither the City's water quantity nor its water quality concerns is static. In responding to its customers' demands and in meeting its regulatory obligations, the City will likely discover both its immediate and long term needs will not be consistent with current or future NIBW remedial activities. As a municipal water provider, therefore, the City must continue to maintain the flexibility to operate its water system and make decisions as to the sources, quality, and rates of water delivered to its citizens.

Response: EPA is aware of the information provided by the City above.

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[15] As a result, the City has disconnected one high nitrate well that had once been treated at the CGTF. Further, the ability to use well combinations at the CGTF has been drastically constrained- e.g., the primary production wells (Nos. 71 and 75A) cannot be run without additional blending.

However, since the above comments are not direct comments regarding any specific component of the Selected Remedy, no response is required.

2. *Groundwater Management Act*

The activities to be undertaken pursuant to the Proposed Plan should also take into account the City's obligations pursuant to the Arizona Groundwater Management Act (GMA), including securing a one hundred year assured water supply.

For over two decades, the City and other municipal water providers in Arizona have been undertaking efforts to reduce their reliance on pumped groundwater as a water supply. The City presently holds an exemption from minimum groundwater pumping requirements until the year 2025 for the groundwater pumped and treated at the CGTF. Pumping requirements pursuant to a remedy implemented under the Proposed Plan will undoubtedly change, particularly if the groundwater modeling and transport studies are correct and the vast majority of the remaining TCE contamination is removed within the next ten (10) years.

Although the City is currently undertaking a detailed water master planning effort, it is not in a position to identify to what extent the pumping activities anticipated under the Proposed Plan may or will conflict with the City's GMA mandates. This situation underscores, however, that the ongoing pumping requirements of NIBW remedial activities must be considered in the context of the other regulatory constraints on the City as a water provider.

Response: The ROD Amendment requires that the groundwater be pumped to capture the contamination plume. The ROD does not specify a role for the City of Scottsdale. EPA understands that the first Consent Decree includes requirements for the City to, among other things, accept the treated groundwater from the CGTF. The City agreed to these provisions during the negotiations of the Consent Decree.

3. *Other Regulatory Enforcement*

As part of its varied NIBW activities, the City faces regulatory compliance obligations in addition to those imposed by the SDWA and the GMA. The City holds a non-Title V Air Quality Permit issued by Maricopa County for the CGTF off-gas air treatment. The City has also secured from EPA and ADEQ, subject to ongoing monitoring and reporting requirements, an exemption from NPDES permitting to use its Well 25 for irrigation purposes.

In essence, while the potentially responsible parties remain responsible for the ultimate remediation of NIBW soil and groundwater contamination, the City's operation of the CGTF and Groundwater Extraction System is simultaneously subject to the varying regulatory programs and compliance regimes of no less than four state and federal agencies. As a result, the City must emphasize its need to retain authority over operational decisions.

Response: In order to meet the Remedial Action Objectives including treatment of contaminated groundwater to meet drinking water standards, capture of the groundwater contamination plume and aquifer restoration, the CGTF must be operated in compliance with the ROD Amendment.

4. *Aging Infrastructure*

The City must point out that the wells and supporting infrastructure needed for the further implementation of EPA's Proposed Plan are part of an aging system. At fifty years following construction, both Wells No.71 and No.72 have reached the approximate full lifetime of wells in the Valley, and the City has previously provided professional advice that Well No. 71 will immediately require either rehabilitation or replacement. Although the City understands the Proposed Plan is intended to set forth only the general components of a groundwater clean-up remedy, attention must now be given to the specific components themselves and, in particular, the integrity of the Groundwater Extraction System.

Response: The ROD requires capture of the groundwater contamination plume via use of the groundwater extraction and treatment systems. If any of the wells become inoperable for whatever reason, then the wells will have to be rehabilitated or replaced.

5. *Minimum Annual Pumping Goal*

Pursuant to the current OU-1 Consent Decree, the City is obliged to operate the Groundwater Extraction System at a minimum of 6,300 gallons per minute averaged over each calendar year. From the time the City began operating the CGTF in 1994, the City has been able to meet this annual minimum pumping requirement four times. Most recently, production totaled 9,798 acre-feet or approximately 6,074 gallons per minute on the average for the year 2000. As a result, the City was required to request a waiver of the Consent Decree requirements for each of those years in which the minimum pumping rate was not reached.

In its March 1, 2001 comments concerning its review of the Feasibility Study Addendum, the Arizona Department of Environmental Quality recommended the current pumping rate of 6,300 GPM should be a project *goal* as opposed to a mandatory requirement. EPA's Preferred Alternative 3A provides, "The *goal* for minimum total annual average pumping rate will remain at 6,300 gallons per minute for wells located in the central part of NIBW." (Emphasis added.)

The City believes use of the 6,300 GPM figure as a minimum annual pumping goal and not a mandatory requirement reflects the real world conditions the City faces as an operator of the CGTF and a provider of water to its citizens. The City supports use of this goal oriented approach as part of the Proposed Plan and appreciates EPA's recognition of this issue.

Response: No response required.

6. *Remedial Action Objectives*

The Proposed Plan notes that the remedy to be selected within an amended Record of Decision (ROD) or Explanation of Significant Differences (ESD) will be required to meet six stated remedial action objectives (RAOs). The first stated remedial objective is to:

"Remove VOCs from groundwater until drinking water standards for VOCs are met."

The fourth stated RAO provides the actions considered in the Proposed Plan are to:

"Provide a potable water source for the City of Scottsdale."

This fourth remedial action objective is also consistent with Section V Purpose of the OU-1 Consent Decree which provides the project work is intended to control the migration of contaminants and reduce groundwater contamination levels "by providing potable water to the City of Scottsdale."

The 1988 Record of Decision addressed only volatile organic chemicals as contaminants of concern. As noted in the 2000 Feasibility Study Addendum, however, an additional NIBW water quality component includes elevated inorganic constituents (nitrates and total dissolved solids) now identified as present at levels above their respective maximum contaminant levels (MCLs). As a consequence, the City must consistently blend water treated by the CGTF and must also consider additional treatment options in order to meet all of its SDWA requirements.[16]

As noted above, the City has over the past several years attempted to accommodate the severe groundwater withdrawal restrictions established under the State Groundwater Management Act. To the extent possible, the City has attempted to develop surface water supplies whenever feasible. Given this mandate to reduce groundwater pumping, the City typically evaluates a groundwater well as a viable water source both in the context of its value as a non-surface water source and whether additional treatment is needed to bring the well's quality to potable standards.

In the instance of the Groundwater Extraction System incorporated as part of the NIBW Project, the City is presently withdrawing water from wells that- absent any other requirements- the City would likely have phased out because of GMA requirements and the degradation attributed to inorganic constituents. As a result, the City suggests there is a need for any implementation of the Proposed Plan to reconcile the two RAOs of (1) removing VOCs from the groundwater with (2) assurances this treated water will indeed provide a viable potable water

[16] In fact, other than for startup water, all discharges from the CGTF will require additional treatment or blending to meet current Consent Decree requirements or other standards.

source for the City's customers.

Response: Based upon information currently available to EPA, the presence of nitrates and total dissolved solids in the groundwater mentioned above is not the result of contamination from the NIBW site. The purpose of issuing this ROD Amendment is to select a final remedy to address the release of hazardous substances at the NIBW Site. These hazardous substances - primarily TCE - have impacted the groundwater at the site and pose a potential threat to human health and the environment.

The RAO regarding supplying Scottsdale with a potable water source has been replaced with the following: "Provide the City of Scottsdale with a water source that meets MCLs for NIBW contaminants of concern (VOCs)."

7. *Single Sampling Event*

EPA's Proposed Alternative 3A provides, "Treated water shall not contain VOCs above EPA's maximum contaminant levels (MCLs) based on any single sampling event." While the City understands the Proposed Plan is not intended to be a finely detailed document, the City suggests that the concept of treated water meeting standards based upon a single sampling event must take into consideration additional pragmatic issues.

The City has previously suggested the need to clarify the concept of sampling events so as to be consistent with SDWA confirmation sampling actions. At this time, therefore, the City wishes only to raise the point that the concept of sampling events is a matter that will require further discussion and refinement.

Response: Please see Section XII.G.4. on page 50 regarding single exceedance criteria.

8. *Conclusion*

The City appreciates the opportunity to comment on EPA's Proposed Plan. As outlined above, the City agrees with EPA's preferred approach as set forth in Alternative 3A. The City supports project efforts that result in capture and containment of the plume and ensure safe drinking water is consistently delivered to area residents.

Response: No response necessary.

F. Significant questions and comments received from Salt River Project (SRP) in writing during the public comment period

1. SRP has concerns with the fact that the remedy does not specifically require the use of well PCX-1. SRP states that the pumping of PCX-1 has been effective in containing the plume of contamination in the northern part of the site and that PCX-1 serves the purpose of restoring some of SRP's lost pumping capability on the Arizona Canal.

Response: See response to I.D.2. above.

2. As indicated above, SRP believes that extraction from PCX-1 should be specified as a requirement in the ROD Amendment.

Response: See response to I.D.2. above.

3. Alternatively, SRP requests that the final remedy require that if PCX-1 ceases to be used that an equivalent amount of water pumping from another source be provided to SRP at the Arizona Canal.

Response: EPA does not have authority over water rights in the state of Arizona. Therefore, EPA cannot provide an alternate source to SRP as requested. The purpose of issuing this ROD Amendment is to ensure that the plume of groundwater contamination does not adversely affect human health and the environment.

4. The Plan calls for treatment of all extracted groundwater using air stripping. This should be clarified to require treatment for all groundwater extracted *as part of the final remedy*. SRP pumps groundwater from clean wells and other wells with low levels of VOCs in the NIBW area according to the conditions set forth in its well system NPDES permit and pursuant to the first NIBW consent decree. These wells do not require treatment.

Response: EPA agrees that not all water pumped at the Site needs to be treated. In Section XII.B. (starting on page 42) the specific wells that will be connected to each of the treatment systems are identified.

5. One of the Remedial Action Objectives in the Proposed Plan is to achieve containment of the groundwater contamination plume by eliminating future migration of the contaminants toward other drinking water supply wells. The Participating Companies developed a groundwater model, presented in the Feasibility Study Addendum, to assist EPA in assessing the capture and containment of the groundwater contamination plumes and in evaluating remedial alternatives. This model uses average annual pumpages based upon historic data and therefore does not take into account the effects of more cyclic pumping patterns (such as extended pumping in drought situations) on plume migration. SRP has the right under the first consent decree to pump its wells in emergency situations such as drought. Under these situations, pumping could potentially impact plume migration. SRP has and will continue to support EPA's remedy by first using the groundwater from remediation sources, such as PCX-1 and Area 12. However, SRP must balance this effort with it's obligations to supply water to it's customers.

Response: EPA must ensure that the NIBW site is effectively remediated and has selected a remedy in this ROD Amendment to ensure that the remedial action objectives are met. In addition, EPA will be conducting ongoing monitoring and five year reviews to ensure that the selected remedy continues to meet the remedial action objectives.

G. Significant questions and comments received from Arizona-American Water Company (Arizona-American Water Company) in writing during the public comment period

1. Arizona-American Water Company is concerned about the potential, due to excessive pumping and treatment, for overdrafting the Study Area's aquifers in a region that is critically dependant upon groundwater.

Response: EPA is sensitive to the issue of overdrafting and does not intend to pump the groundwater in excess of what is necessary to control the plume. In addition, the remedy must be implemented in accordance with Arizona's Groundwater Management Act which is intended to ensure "safe yield" from the aquifers in the Phoenix Active Management Areas.

2. In addition, according to Arizona-American Water Company, there is the potential for inappropriate diversion of treated groundwater to other jurisdictions which could also lead to inadequate water supply for affected communities. Arizona-American Water Company strongly encourages EPA to work with the Arizona Department of Water Resources and other interested agencies to assure that the multiple goals of source control, groundwater remediation, and water supply are kept in the appropriate balance. Arizona-American Water Company is confident that EPA does not want its remediation strategy to lead to the unintended consequence of an inadequate water supply for the citizens of the area.

Response: EPA has worked closely with ADWR regarding all site remediation activities and will continue to do so. However, EPA does not have authority over water rights or water supply issues in the state of Arizona. EPA must ensure that the NIBW site is effectively remediated and has selected a remedy in this ROD Amendment to ensure that the remedial action objectives are met.

II. Technical and Legal Issues

A. Technical Issues:

1. Many of the citizens have raised the issue of the potential for pumping the groundwater as part of the NIBW remedy to cause subsidence.

Response: As a result of the citizens' concerns regarding subsidence, EPA has researched the causes of subsidence in the NIBW area and evaluated the potential for groundwater extraction at NIBW to effect subsidence. The citizens essentially raised two major issues:

a. Will the groundwater extraction associated with the NIBW remedy cause subsidence? and

b. Will the use of recharge or reinjection of groundwater in the area prevent or offset the potential for subsidence?

Based on the historical and technical information provided below, EPA has determined that the groundwater extraction at NIBW is not significantly increasing the potential for subsidence in the NIBW area. The recharge or reinjection of extracted groundwater would not offset the potential for

subsidence to occur.

It is common knowledge that groundwater in the state of Arizona has historically been overpumped. Over pumping resulted in the lowering of the groundwater table. By 1991 the groundwater table within the FSA Study Area and adjoining areas had declined by as much as 150 to 300 feet. When too much groundwater is extracted and the water level declines, the water in the spaces between the gravel and sand particles which make up the alluvial fill is removed and the particles, which are under pressure from the land above, settle and compact (Schumann and Associates, 1998). The more the water level declines, the greater the amount of alluvial particles that are exposed to this settling or compaction phenomenon, and the more serious the subsidence is likely to become. It is important to note that once the alluvial fill or sediments have been compacted, they cannot be re-inflated to reverse or undo subsidence (Schumann and Associates, 1998). Another important characteristic of subsidence is that there is usually a substantial delay of 10 years or more between the dewatering of an aquifer and a significant decline in the earth's surface (Schumann and Associates, 1998).

With the decline of agriculture in the Phoenix area, the demand on the groundwater resources also declined. Although a significant amount of groundwater is still extracted for drinking water and other purposes, the groundwater table has recovered in recent years. If subsidence occurs in the NIBW study area it will not be because of current overdrafting of the aquifer(also see response to I.G.1 above). Instead, the cause will be historic depletion of the aquifer. The Selected Remedy will be operated in such a manner to ensure that groundwater sources are not depleted and the potential for subsidence is not exacerbated. The potential for land subsidence should be closely monitored and carefully considered in the planning of future water resource use. The ADWR has committed to a regional program of subsidence monitoring that was initiated in 1999 (ADWR, 1999). The ADWR study will develop the necessary baseline data in the Study Area to verify and quantify any future land subsidence.

As stated above, once the alluvial fill or sediments have been compacted, they cannot be re-inflated to reverse or undo subsidence (Schumann and Associates, 1998). In other words, recharge or reinjection of groundwater from the NIBW site will not reverse the potential for subsidence or prevent subsidence from occurring.

B. Legal Issues: There are no specific legal issues regarding issuance of this ROD Amendment.

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
Chemical-Specific ARARs			
Federal Safe Drinking Water Act 42 U.S.C. 300g-1, 40 CFR 141.161	Establishes Maximum Contaminant Levels (MCLs) for drinking water supplies.	Applicable	MCLs have been established for a number of common organic and inorganic contaminants. These levels regulate the concentrations of contaminants in public drinking water supplies. The selected remedy will comply with these requirements. The cleanup levels for the VOCs in the aquifer are set at MCLs[1].
Clean Water Act 33 U.S.C 1311-1387	Establishes Water Quality Criteria for surface waters	Relevant & Appropriate	The CWA Water Quality Criteria are designed to protect aquatic life (both marine and freshwater). These standards are expressed on the basis of acute and chronic toxicity levels. The selected remedy will comply with these requirements. Any treated groundwater that is discharged into a surface water body will meet the CWA Water Quality Criteria.
Clean Water Act 40 CFR 402, 405-471; 40 CFR 125	Establishes the National Pollutant Elimination Discharge System (NPDES) Permit Program	Relevant & Appropriate	The NPDES permit program regulates discharges into "waters of the United States" by establishing numeric limits and monitoring requirements for such discharge. The discharge of treated water to Arizona Canal System (when necessary) shall meet the substantive requirements of an NPDES permit.
Location-Specific ARARs			
Clean Air Act 42 U.S.C. 7401 et seq.	Establishes National Ambient Air Quality Standards (NAAQS)	Applicable	NAAQSs are numeric limits for contaminants in air emissions. These requirements apply to all treatment systems that discharge emissions. The selected remedy shall comply with the air discharge requirements of the CAA (NAAQS).

[1] Achievement of MCLs are specifically required for the site-related contaminants identified in Table 3 (Decision Summary).

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
40 CFR Part 50 and 40 CFR Part 52 Subpart D; AAC § R18-2-201 to 220 and § R-18-2-730 (D) & (G)	Requires compliance with local air standards	Relevant & Appropriate	Any source of criteria pollutants located in an NAAQS non-attainment area must comply with local air quality regulations. NIBW is located in Maricopa County which is a non-attainment area for ozone, carbon monoxide (CO) and particulate matter less that 10 microns in size. The selected remedy will comply with these emissions standards.
A.R.S. § 49-104(11)	Regulates air emissions	Relevant & Appropriate	Air stripping equipment must be operated so that no gaseous or odorous emissions are emitted in concentrations that cause air pollution that is harmful to human health or the environment, cause damage to property, or unreasonably interfere with comfortable enjoyment of life or property. Air stripping units at NIBW must comply with these emissions standards.
Maricopa County Air Pollution Control Regulations Rule 330, § 301	Regulates air emissions in Maricopa County	Relevant & Appropriate	The VOC emission controls must have an overall efficiency of at least 85%. The groundwater treatment systems at NIBW, which are within Maricopa County, shall not emit more that 3 lbs/day of VOCs.
40 CFR Part 265 Subparts AA and BB: AAC § R18-8-265(A)	Regulates air emissions	Relevant & Appropriate	RCRA requirements apply to air emission standards for process vents and equipment leaks associated with distillation, solvent extraction, or air stripping operations. Process vent standards apply to air stripping operations that manage hazardous wastes with organic concentrations of 10 ppm by weight or more. Equipment leak standards apply to equipment that contains or contacts hazardous wastes with organic concentrations of 10% by weight or more. This would be applicable for the NIBW groundwater treatment units if concentrations being treated are 10 ppm or 10% by weight or more.
Resource Conservation and Recovery Act 42 U.S.C. 6901 et.seq. 40 CFR 264.18(a) &(b)	Regulates activities in earthquake zones and 100-year floodplains	Potentially Applicable	A RCRA facility located in areas where earthquakes could occur and 100-year floodplains must be designed, constructed, operated and maintained to prevent damage due to earthquakes or washout of any hazardous waste by a 100-year flood. Since the treatment facilities will generate hazardous waste, any facility constructed within an earthquake zone or a 100-year floodplain shall comply with this requirement.

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
National Archaeological and Historical Preservation Act 16 U.S.C. 469; 36 CFR Part 65	Protection of archaeological and historical artifacts	Potentially Applicable	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeological data may require actions to recover and preserve artifacts. The selected remedy will not alter or destroy any known prehistoric or historic archeological features at or near the NIBW site. The areas in and around NIBW are essentially completely developed. However, because there is always a possibility that buried historic or prehistoric remains could be discovered during construction, this regulation would require action to recover and preserve such artifacts.
Endangered Species Act 16 U.S.C. 1531-1544; 50 CFR Part 200 and 50 CFR Part 402	Protects critical habitat upon which endangered species or threatened species depend.	Potentially Applicable	Requires action to conserve endangered species or threatened species, including consultation with the Department of Interior, Fish and Wildlife Service. There are currently no known endangered species existing at NIBW. However, because there is always a possibility that endangered species could be discovered during implementation of the selected remedy, any action that may impact or threaten the impact an endangered species shall comply with this requirement.
AAC § R18-4-501	Identifies siting requirements for new treatment units	Potentially Applicable	In the event that it is necessary to construct a treatment plant to replace the MRTF, the siting requirements identified in these regulations would have to be complied with.

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
Action-Specific ARARs[1]			
40 CFR Part 261 and AAC § R18-8-261	Identification and listing of hazardous wastes	Relevant & Appropriate	Establishes procedures and numeric limits for identification and management of characteristic hazardous wastes, listed hazardous wastes, and State-only (non-RCRA) hazardous wastes. These requirements are relevant to management of waste materials generated as a result of construction and operation of the selected remedial action.
40 CFR Section 262.11 and AAC § R18-8-262	Generation of waste from construction & operation due to implementation of remedial action selected	Applicable	Requires waste generators to determine if wastes are hazardous wastes and establishes procedures for such determinations. These requirements are applicable to management of waste materials generated as a result of construction of the selected remedial action or operation of any of the groundwater treatment units at NIBW.
40 CFR § 270	RCRA permit requirements	Relevant & Appropriate	Environmental media containing RCRA listed hazardous waste must be managed as a RCRA hazardous waste. To the extent, if at all, that purge water associated with groundwater monitoring activities contains RCRA listed hazardous waste, then the purge water at NIBW must be managed as a RCRA hazardous waste. The NIBW groundwater itself must be managed as a RCRA hazardous waste due to fact that is contains a RCRA listed waste. Therefore, onsite treatment of the groundwater is subject to substantive requirements of RCRA permits.

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
40 CFR Part 264	Establishes standards for owners and operators of treatment, storage and disposal facilities	Relevant and Appropriate	The owners and operators of facilities required by this Remedial Action must comply with the applicable portions of RCRA Part 264. Containers of hazardous waste must be: (1) maintained in good condition; (2) compatible with hazardous waste to be stored; and (3) closed during storage (except to add or remove waste) These requirements would be applicable at NIBW for any contaminated soils or groundwater or treatment system waste that might be containerized and stored onsite prior to treatment or final disposal. If it becomes necessary to verify exceedances of MCLs at any of the NIBW groundwater treatment plants, these procedures shall be used to ensure that the data is accurate and to avoid false negatives or false positives.
40 CFR § 262.34	Regulates Shipment of hazardous wastes for treatment or disposal offsite	Relevant and Appropriate	Specifies maximum amounts and maximum periods for accumulation of hazardous waste onsite under generator status. These requirements are potentially applicable to management of waste materials generated as a result of construction of the remedial action at NIBW and operation of any of the groundwater treatment plants if the waste materials generated are hazardous wastes.
A.R.S. § 49-221: AAC § R18-11-101 *et seq.*	Regulates discharges to surface water	Applicable	Discharge from treatment systems must comply with Arizona State Water Quality Standards for Surface Waters. This requirement is applicable at times when treated water is discharged to surface water (Arizona Canal System).
A.R.S. § 49-222	Provides standards for navigable waters	Relevant and Appropriate	These standards assure water quality for protection of public health and takes into consideration its use and value for public water supplies, the propagation of fish and wildlife, recreational, agricultural, industrial and other purposes including navigation.
A.R.S. § 49-224	Aquifer identification and classification	Relevant and Appropriate	All aquifers in the state identified under § 49-222(A) and any other aquifers subsequently discovered shall be classified for drinking water protected use.

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
40 CFR Part 122 and Part 125	Regulates discharges to surface water	Applicable	Establishes, treatment and monitoring requirements for discharges to surface water. The substantive requirements of the NPDES program are applicable when treated groundwater is discharged to surface water (Arizona Canal System).
Resource Conservation and Recovery Act 40 CFR 264 (Subpart X): 264.600, 264.601, 264.602, 264.603; AAC § R18-8-264	Establishes requirements for owners and operators of treatment, storage and disposal facilities	Relevant and Appropriate	Miscellaneous treatment units must satisfy environmental performance standards by protection of groundwater, surface water, and air quality, and by limiting surface and subsurface migration. Air stripping towers and soil vapor extraction (SVE) treatment units are considered miscellaneous RCRA units; therefore the substantive portions of these requirements would be applicable in the construction, operation and maintenance and closure of air stripping and SVE units at NIBW.
40 CFR § 144.12 - 144.16	Regulates the reinjection of groundwater	Applicable	Criteria and standards for the Underground Injection Control (UIC) Program. These criteria include current and future use, yield and water quality characteristics and are applicable at NIBW for determining exempt aquifers. Injection wells at NIBW will comply with these design, construction, operation and maintenance requirements.
A.R.S. § 45-454.01	Requirements for wells, groundwater withdrawal, treatment, and reinjection	Applicable	Exempts new well construction, withdrawal, treatment, and reinjection into the aquifer of groundwater that occur as part of a CERCLA Remedial Action from requirements of Arizona Groundwater Code, except that they must comply with the substantive requirements of: ARS 45-594 (well construction standards) ARS 45-595 (well construction requirements) ARS 45-596 (notice of intent to drill a well) ARS 45-600 (filing of log by driller of well)
Arizona Well Spacing and Well Impact Rules AAC § R12-15-830	Regulates the placement of new production wells in the state of Arizona	Relevant and Appropriate	New production wells will not be permitted in the NIBW area that may have an adverse impact on the groundwater remediation systems or hydraulic capture of the contaminated plumes.

AAC § R18-4-502	Identifies minimum design criteria for treatment units	Potentially Applicable	In the event that it is necessary to construct a drinking water treatment plant to replace the MRTF, the minimum design criteria identified in these regulations would have to be complied with.
AAC § R18-4-701 to R18-4-704 and R18-4-706	Identifies requirements for annual consumer confidence reports	Relevant and Appropriate	Requires MRTF and CGTF to comply with the notification requirements in these regulations.

U.S.C. - United States Code
CFR - Code of Federal Regulations
A.R.S. - Arizona Revised Statutes
A.A.C. - Arizona Administrative Code